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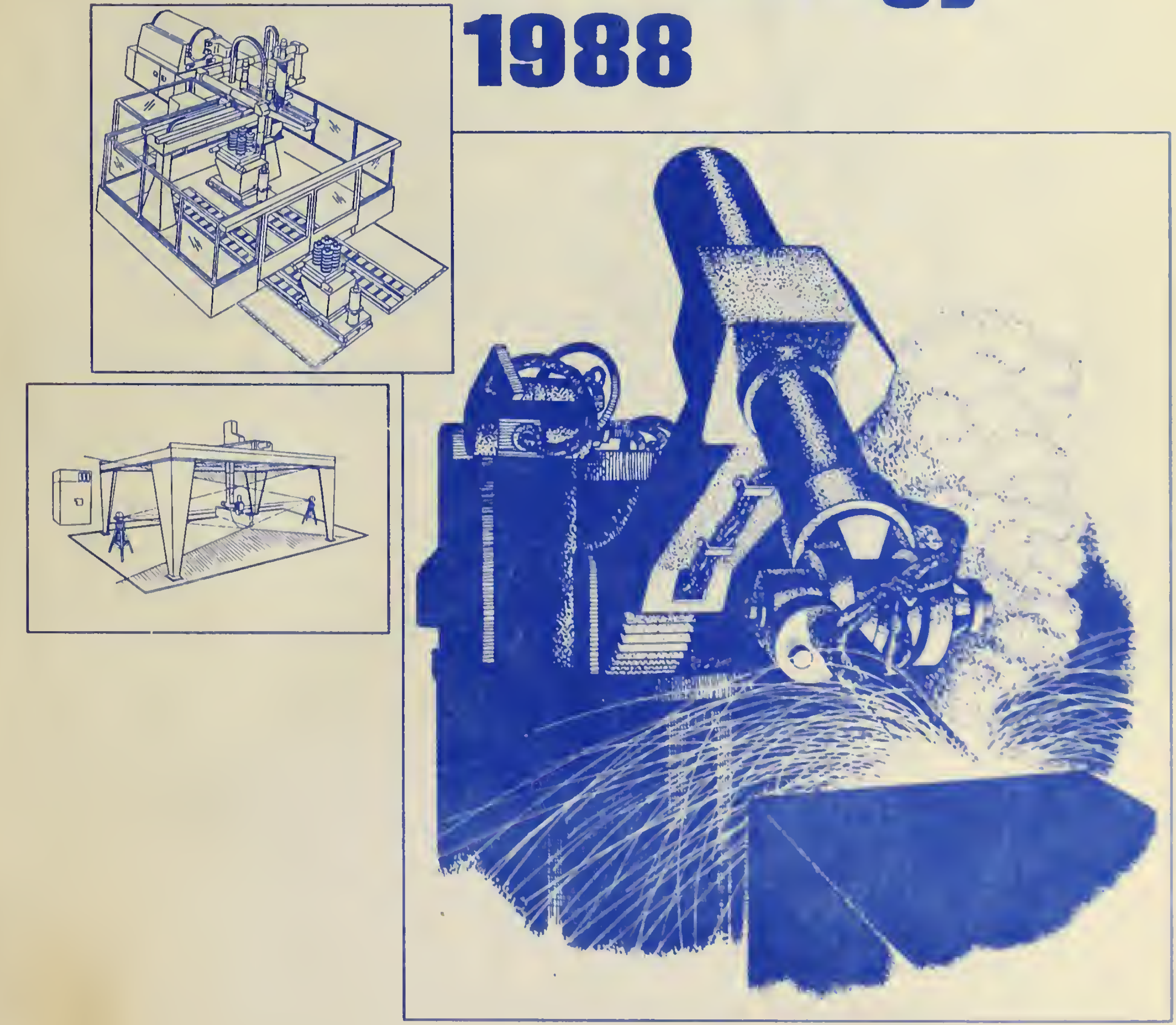

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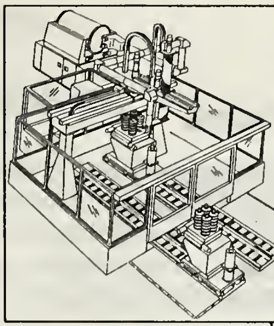

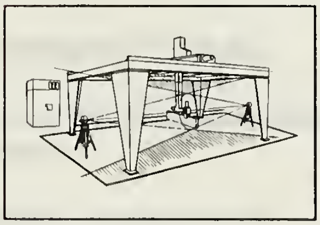

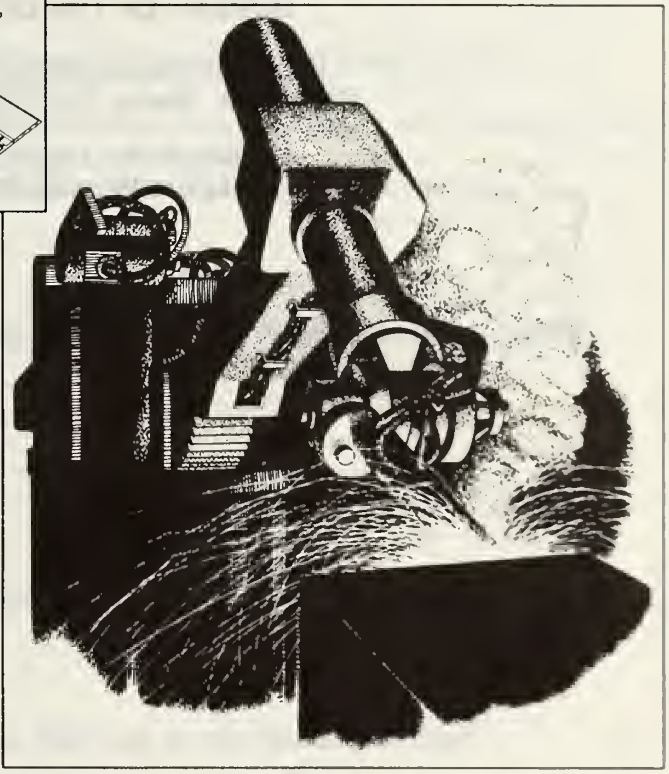

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Robert A. Mosbacher, Secretary

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Contents

Page

INTRODUCTION 1

SUMMARY TABLES

1. Percentage of Establishments Using and Planning to Use Technologies by Characteristic of the Establishment 7
2. Number and Percentage of Establishments Using, Planning, or Not Planning to Use Selected Technologies 9
3. Number of Establishments by Number of Technologies Used or Planned 10

CHARACTERISTIC TABLES

Percentage of Establishments Using, Planning, or Not Planning to Use Selected Technologies—

4a. By Major Groups 34 to 38 11
4b. By Employment Size 15
4c. By Age of Plant (Years) 17
4d. By Manufacturing Process 20
4e. By Market for Most Products 23
4f. By Market Price for Most Products 27

TECHNOLOGY TABLES

Percentage of Establishments Using, Planning, or Not Planning to Use:

Design and Engineering—

5a. Computer Aided Design (CAD) or Computer Aided Engineering 31
5b. Computer Aided Design (CAD) Output Used to Control Manufacturing Machines 32
5c. Digital Representation of Computer Aided Design Output Used in Procurement Activities 33

Fabricated/Machining and Assembly—

6a. Flexible Manufacturing Cells or Systems 34
6b. Numerically Controlled or Computer Numerically Controlled Machines 35
6c. Materials Working Lasers 36
6d. Pick and Place Robots 37
6e. Other Robots 38

Automated Material Handling—

7a. Automatic Storage and Retrieval Systems 39
7b. Automatic Guided Vehicle Systems 40

Automated Sensor Based Inspection or Testing—

8a. Performed on Incoming or in Process Materials 41
8b. Performed on Final Product 42

Communications and Control—

9a. Local Area Network for Technical Data 43
9b. Local Area Network for Factory Use 44
9c. Intercompany Computer Network Linking Plant to Subcontractors, Suppliers, or Customers 45
9d. Programmable Controllers 46
9e. Computers Used for Control on the Factory Floor 47

APPENDIXES

A. Explanation of Terms A-1
B. Report Form B-1
C. Sampling and Estimating Methodologies C-1
D. Estimates of Relative Standard Error for the Number of Establishments, by Characteristics D-1

Manufacturing Technology: 1988

INTRODUCTION

Several years ago, a need was perceived for comprehensive data on the pattern of use and diffusion of process technologies across major manufacturing industries. In numerous articles and papers, the point was repeatedly made that the future productivity and competitiveness of American industry will depend, to a large extent, upon regaining our former leadership in the development and use of manufacturing technology. This view was clearly stated in the *Report of the President's Commission on Industrial Competitiveness:* "Perhaps the most glaring deficiency in America's technological capabilities has been our failure to devote enough attention to manufacturing or 'process' technology." With more and more of our industrial base dependent on new technology, industry not only must increase its efforts to develop new technologies by increasing its research and development investment in innovation, it also must do a better job in adopting and applying technologies in the manufacturing process.

In an effort to address this important issue, a group was formed within the Industry Division of the Bureau of the Census to begin developing a survey aimed at measuring the current use and planned use of advanced technology within the manufacturing sector.

As part of the survey development process, copies of the initial questionnaire and technology definitions were sent to a broad cross section of Government, private industry, and academic experts for comment. They were asked to comment on the following aspects of the survey: 1) the need for and usefulness of the data; 2) survey content; 3) survey definitions; 4) planning horizon intervals for acquiring selected technologies; and, 5) suggestions for follow-on surveys. Of those responding, almost 90 percent agreed that there was a need for this type of data. Most indicated that the need was critical and many reported that no other data sources were available. Based on the feedback received from these groups, we proceeded with our development of the survey.

SCOPE OF THE SURVEY

The Survey of Manufacturing Technology (SMT) is a sample survey of 10,526 establishments with 20 or more employees selected to represent a total universe of 39,556 manufacturing establishments classified in Standard Industrial Classification (SIC) Major Groups 34 - 38.

SIC Major Group	Description
34	Fabricated Metal Products
35	Industrial Machinery and Equipment
36	Electronic and Other Electric Equipment
37	Transportation Equipment
38	Instruments and Related Products

These major groups accounted for 43 percent of all employees and value added as reported in the 1987 Census of Manufactures.

The questionnaire was designed to obtain reliable measures of prevalence for 17 advanced technologies, plans to use, reasons for no plans to use, and limited information on plant characteristics. The 17 technologies were chosen from the following general areas:

- Design and engineering
- Fabrication/ machining and assembly
- Automated material handling
- Automated sensor-based inspection and/ or testing
- Communication and control

For a complete description of the advanced technologies covered by the survey, see Appendix B, Report Form.

SUMMARY OF FINDINGS

General Use of Advanced Technology

Most manufacturing plants classified in SIC major groups 34 through 38 use at least one of the 17 advanced technologies included in the survey in their operations. In the survey, we found that 68.4 percent of the plants use at least one technology, with 23.1 percent reporting that they use five or more of these technologies. Larger plants tend to adopt all of the technologies in this survey more rapidly than smaller plants. For those establishments with 500 or more employees, 93.7 percent and 79.4 percent reported use of at least one and at least five technologies respectively, compared with 60.9 and 13.2 percent for establishments with under 100 employees.

Technology use tended to be greatest when a plant performed both fabrication/ machining and assembly at the same location. Other factors indicative of a high probability of an establishment's use of advanced technology include plants where government or transportation constitutes the primary market for the establishment's products, where the products are made to military specifications, or where the market price for most products of the establishment exceeds $10,000. Narrow differences separate technology use totals in different SIC major groups, with the exception of major group 34, "Fabricated Metal Products," where use consistently trails the other four major groups. Although the survey results do not indicate any relation between general use of these technologies and the age of the plant, for individual technologies such relationships do exist.

The reason most often cited by establishments that do not use or plan to use a technology was that it is not applicable to their operations. The highest proportion attributed to this reason was 70.7 percent of nonusers of numerically controlled/ computer numerically controlled machines (NC/ CNC); the lowest was 55.8 percent of non-users of automatic storage and retrieval systems (AS/ RS). The proportion of establishments citing cost-ineffectiveness as their reason for non-use ranged from 19.2 percent of non-users of local area networks for technical data to 36.4 percent for AS/ RS.

Of the 17 technologies covered by the survey, use is highest for NC/ CNC and for computer-aided design and/ or computer aided engineering (CAD/ CAE), at 41.4 percent and 39.0 percent respectively. Programmable controllers and computers used for control on the factory floor were the next most prevalent technologies. The technologies used least were the two materials handling technologies on the survey, automatic guided vehicle systems and automatic storage and retrieval systems, at 1.5 percent and 3.2 percent respectively. Still, nearly twice as many establishments as presently use these latter two technologies indicated that they plan to use them within the next five years. When existing technology use and planned use within the next five years are summed, the picture differs slightly. CAD/ CAE would be the most frequently used technology (58.6 percent), followed by NC/ CNC and factory floor control computers (49.3 percent). Use of the two materials handling technologies would remain under 10 percent, use of materials working lasers and robots would lie between 10 and 20 percent, with the remainder of the technologies used by between 20 and 40 percent of the establishments within the scope of this survey. For 11 of the technologies, projected use would at least double if all plans to use are fulfilled. More than half of the establishments indicated use or plans to use for 13 of the 17 surveyed technologies.

Use of Individual Advanced Technologies

Use among the 17 technologies in this report varied widely. Marked differences in use for a technology also occurred among establishments grouped by different characteristics. Establishment characteristics used to group plants in the tables and in the following discussion include the number of employees at the plant, the plant's age, the type of processing employed at the plant, the market for most products of the plant, the market price of most products of the plant, whether or not any of the products of the plant are made to military specifications, and whether the plant is a contractor to the U.S. military.

Establishments were not asked to provide the extent of use of a technology in their operations. For example, regardless of whether an establishment had 1 pick and place robot or 100 pick and place robots in place, each establishment was counted equally as using pick and place robots in their operations. Therefore, interpretations as to the extent of use and penetration for a technology should be made cautiously. In addition, all references to plans to use a given technology are for those establishments that do not currently use the technology in operations. While we realize that establishments currently using a given technology may have plans to acquire more of that technology in the future, this information was not collected in the survey.

What follows are brief highlights of the survey findings for each of the 17 technologies covered by the survey.

Computer Aided Design (CAD) and/ or Computer Aided Engineering (CAE)

Although this technology was one of the two most prevalent across the survey sample, its use in major group 34, "Fabricated Metal Products," trailed use in the other four major groups. Of those plants manufacturing products with a market price of over $10,000, 61.8 percent reported using this technology in their operations, compared to only 28.6 percent of those plants producing products with a market price under $5. In the survey, only 7.7 percent of respondents felt that this technology was not cost-effective, one of the lowest percentages given to any of the 17 technologies. CAD/ CAE also had one of the lowest percentages (21.6 percent) citing inapplicability as the reason for nonuse. A high 82.6 percent of the establishments with over 500 employees stated that they used this technology in their operations. According to the current and planned usage percentage of 58.6, in five years this will become the most prevalent of the 17 technologies covered by this survey.

CAD Output Used to Control Manufacturing Machines (CAD/ CAM)

Establishments in major industry group 35, "Industrial Machinery and Equipment," reported the highest usage rate of this technology, at 21.6 percent. Plant age had virtually no discernable effect on the likelihood that it would use CAD/ CAM. A relatively high 21.1 percent of establishments indicated that they plan to use CAD/ CAM within the next five years, with 9 percent planning to implement it in the next two years.

Digital Representation of CAD Output Used in Procurement Activities

Although the current 9.9 percent usage rate is low, 17.5 percent of plants indicated that they planned to use this technology in the next five years. Establishments in major group 34, "Fabricated Metal Products," reported lower use than that of the other major groups surveyed. Firms whose primary market consists of government have a 17.8 percent usage rate, which is higher than that of any other market segment. A large number of employees is another factor characterizing establishments that are more likely to use this technology.

Flexible Manufacturing Cells or Systems

Nearly half (48.6 percent) of the plants with over 500 employees now use or plan to use this technology within the next two years. The usage rate of 18.0 percent for plants making goods for the transportation industry was higher than for any other market segment. This technology had one of the highest rates of responses that it was not applicable to their operation (46.0 percent). Plant age does not appear to be related to the propensity to use this technology.

Numerically Controlled or Computer Numerically Controlled Machines (NC/CNC)

This technology is used more frequently (41.4 percent) than any other technology covered by the survey. Usage was much higher in plants that performed either fabricated machining or fabricated machining and assembly. Only 15.1 percent of the plants engaged in assembly operations only use NC/CNC. Unlike most of the technologies, use appears to be related to the age of the plant, with use more likely in plants over 30 years of age (50.0 percent), compared to plants under 5 years of age (37.3 percent). The planned usage of 7.9 percent within the next 5 years was among the lowest reported for the technologies covered by the survey. NC/CNC also was the only technology where the usage rate for plants with fewer than 100 employees was more than half that of plants with more than 500 employees. Major group 35, "Industrial Machinery and Equipment," posted a usage rate of 56.7 percent, well above the next highest major group. Use in establishments making products selling for under $5 or products for the consumer market was substantially lower than use in other categories of establishments.

Materials Working Lasers

The number of plants responding that this technology was not applicable to their operation (53.6 percent) was one of the highest among the 17 technologies. Although materials working lasers have one of the smallest usage rates (4.3 percent), usage will more than double in the next 5 years if plans to use are fulfilled. At 10.4 percent, use by firms marketing to the government is about double that of any other market segment. This technology is approximately nine times more likely to be found in establishments with 500 or more employees than in those with less than 100 employees.

Pick and Place Robots

In the survey, this technology was found about 16 times more frequently in plants with 500 or more employees than in those with under 100 employees. Use is highest in major group 36, "Electronic and Electrical Equipment." Plants selling their products to the transportation market were the highest implementers of these types of robots (16.1 percent). Unlike most technologies, older plants (over 30 years) had a higher usage rate of 11.5 percent, than did younger plants (under 5 years), at 4.6 percent.

Other Robots

Only 5.7 percent of the establishments reported use of other robots. A large proportion of the surveyed establishments (45.4 percent) indicated that they felt this technology was not applicable to their operations. This technology was much more likely to be found in larger establishments with 35.0 percent of plants employing 500 or more persons reporting its use compared to only 2.4 percent of plants with under 100 employees. Still, of the small establishments with under 100 employees, three times as many plants as currently use this technology indicated that they planned to use it in the next five years. Use in plants whose major market is transportation was highest, at 12.8 percent.

Automatic Storage and Retrieval Systems (AS/RS)

At 3.2 percent, use of AS/RS is the second lowest of all the technologies. The 30 percent of establishments indicating non-use due to cost considerations was among the highest of any of the technologies; the 46 percent stating inapplicability was also among the highest. Establishments with more than 500 employees are about 20 times more likely to have an AS/RS as are those with fewer than 100 employees. Manufacturers with assembly operations are the most likely to use AS/RS.

Automatic Guided Vehicles

The 1.5 percent usage rate of this technology is the lowest of any of the technologies covered by the survey. More than half of the plants indicated that automatic guided vehicles were inapplicable to their operation. Even if all plans to use within the next 5 years are implemented, the usage rate of 5.3 percent would remain the lowest of all the surveyed technologies. Large plants with over 500 employees reported much higher use of this technology (13.1 percent), than did smaller plants with under 100 employees (0.5 percent).

Automated Test Performed on Incoming or In-Process Materials

Ten percent of all plants covered by the survey use this technology, led by the 16.2 percent for major group 36, "Electronic and Electrical Equipment." Suppliers to the government market reported a high incidence of this technology (19.2 percent), as did suppliers to the transportation market (15.4 percent). Use is approximately seven times higher in the larger establishments than in establishments with under 100 employees.

Automated Test Performed on Final Product

Producers in major group 36, "Electronic and Electrical Equipment," were more likely to employ this technology than were producers in other major groups. Of those plants with 500 or more employees, 44.3 percent reported using the technology, compared to only 8.0 percent of those plants with under 100 employees. The highest levels of incidence of this technology occurred among plants producing goods primarily for the government (23.3 percent) and transportation (20.0 percent) markets.

Local Area Network (LAN) for Technical Data

Only 10.6 percent of the establishments felt that a LAN for technical data was not cost-effective for their operations. From its current usage rate of 18.9 percent, usage will almost double to reach 36.1 percent over the next 5 years if all plans to use are fulfilled. Use is particularly high in major groups 38, "Instruments and Related Products," and 36, "Electronic and Electrical Equipment," at 25.8 and 24.9 percent respectively. Of plants with more than 500 employees, 58.6 percent report use of a technical data LAN, compared to 13.1 percent of plants with under 100 employees.

Local Area Network (LAN) for Factory Use

Current use of this technology is 16.2 percent. Of the plants with more than 500 employees, 50.7 percent use this technology. Plants with assembly operations are more likely to use a factory LAN. Within the next two years, 9.2 percent of plants plan to implement this technology. In five years, more than a third of the plants will use a factory LAN if current plans are fulfilled.

Intercompany Computer Network Linking Plant to Subcontractors, Suppliers, and/or Customers

Currently, use of this technology is 14.8 percent. An additional 20.3 percent of establishments intend to implement an intercompany supplier/customer network within the next five years. Establishments in major group 37, "Transportation Equipment," and suppliers to the transportation market lead in implementation, with usage rates of 21.7 and 32.6 percent respectively. Use is substantially higher for producers of goods selling for under $100. This technology had one of the highest rates of planned use in the two to five year time frame (12.4 percent). Unlike most of the other technologies, establishments marketing to the government were not among the leaders in implementation of this technology.

Programmable Controllers

The current usage rate of 32.1 percent for this technology was among the highest of the 17 technologies covered by the survey. The incidence of this technology seems to be fairly evenly distributed among the industry groups surveyed. Of plants with over 500 employees, 77.8 percent reported using this technology in their operations, compared to 22.5 percent of plants with under 100 employees. For plants over 30 years of age, 39.0 percent reported using programmable controllers, compared to 29.6 percent of plants under 5 years of age.

Computers Used for Control on the Factory Floor

This technology had one of the highest incidence rates reported in the survey at 27.3 percent. An additional 22 percent of plants intend to use computer control within the next five years, pushing total incidence to nearly 50 percent if all plans are fulfilled. The incidence was greatest (68.0 percent) among the larger plants with 500 or more employees. Among those establishments with the government as their primary market, 41.0 percent reported using this technology, with another 24.3 percent indicating plans to use it within the next 5 years.

METHODOLOGY

Test of Procedures and Methods

Because a survey of this kind had not been conducted before, a test of the survey procedures and methods was conducted during the period of August through October 1987. The test consisted of mailing questionnaires to a non-random sample of 300 manufacturing establishments and was designed to provide information on such topics as the appropriateness and accuracy of the questions, identifying the person most knowledgeable about the company and its plans to adopt advanced technologies, the extent of respondent burden, the clarity of the survey definitions and instructions, plant versus company-level reporting, and response rates. The results of the test indicated that the questionnaire and survey procedures worked well and only minor modifications to the questionnaire were required.

Mailout and Followup Activities

The sample of 10,526 establishments with 20 or more employees was mailed in September, 1988. Two mail follow-ups were made to delinquent cases during September and October. A final nonresponse follow-up was conducted by telephone using trained interviewers from the Census Bureau's centralized telephone facility. Using computer-assisted telephone interviewing (CATI), the interviewers were able to contact and complete interviews with approximately 900 nonrespondents and about 550 partial response cases. The data collection phase of the survey was completed in November, 1988.

Survey Response Rates

The information presented below provides a breakdown of the response and nonresponse for the survey:

9,682	Completed reports
106	Out of business
39	Out of scope of the survey
121	Refusals
222	Postmaster returns (no better address found)
356	Miscellaneous (contact unavailable, sold/no successor found, strike, plant idle, etc.)
10,526	Total sampled cases mailed

From this information, we can calculate a response rate that reflects the percentage of sampled plants that returned completed questionnaires. For the Survey of Manufacturing Technology, the overall response rate was 93.3 percent. To obtain this response rate, we first calculated the total number of cases that were active and in-scope of the survey. This was done by subtracting the out-of-business cases (106) and the out-of-scope cases (39) from the total number of sampled cases mailed (10,526) to obtain 10,381 total active, in-scope cases. Then, by dividing the total completed cases (9,682) by the total active, in-scope cases (10,381), we obtained the overall response rate of 93.3 percent.

Another useful indicator is the refusal rate. This rate is based on the number of refusals received from plants actually contacted and reflects the degree of cooperation on the survey. The refusal rate for the survey was 1.2 percent. This rate was calculated in the following manner. First, we derived the total number of cases contacted. This was done by subtracting the out-of-business cases (106), the out-of-scope cases (39), postmaster returns (222), and miscellaneous cases (356) from the total cases mailed (10,526) to obtain the total cases contacted (9,803). Then, by dividing the refusal cases (121) by the total cases contacted (9,803), we obtained the refusal rate of 1.2 percent.

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Table 1. **Percentage of Establishments Using and Planning to Use Technologies by Characteristic of the Establishment**

Establishment characteristic	Number of establishments[1]	Minimum number of technologies used (Percent of establishments)							Planning to acquire at least 1 additional technology within 5 years						
		0	1	2	3	4	5	Not specified	Percent of column:						
	(a)	(b)	(c)	(d)	(e)	(f)	(g)		A	B	C	D	E	F	G
All establishments...	39,556	23.7	68.4	54.1	41.6	31.7	23.1	7.9	59.7	42.0	72.7	76.1	78.7	79.4	80.0
Major Group:															
34, Fabricated Metal Products	12,746	32.6	58.6	44.1	32.2	24.1	17.0	8.8	54.6	39.7	71.0	75.9	79.3	79.1	82.1
35, Industrial Machinery and Equipment...........	13,176	18.1	75.6	61.1	46.2	33.8	23.1	6.3	62.3	46.5	71.3	72.9	76.0	77.2	77.9
36, Electronic and Other Electric Equipment...........	7,293	17.1	73.4	59.8	48.2	39.0	30.1	9.5	63.0	41.3	76.2	79.8	81.1	81.6	83.2
37, Transportation Equipment...........	3,425	28.2	62.7	49.3	41.5	34.4	28.7	9.2	57.7	36.6	75.6	80.2	82.7	83.5	85.5
38, Instruments and Related Products.....	2,916	21.3	72.3	58.0	45.8	33.6	25.8	6.4	63.8	50.3	73.5	77.5	78.4	79.7	80.3
Employment size:															
20 to 99.............	27,369	30.5	60.9	44.5	30.9	21.3	13.2	8.6	53.7	41.4	67.4	70.5	73.7	73.0	74.2
100 to 499	9,903	10.1	83.2	72.1	60.3	48.1	37.4	6.7	71.5	46.8	80.3	82.9	83.5	85.0	86.0
500 and over	2,284	1.5	93.7	91.4	89.3	85.1	79.4	4.8	80.3	57.8	84.7	84.8	85.0	85.2	85.1
Age of plant (years):															
Less than 5...........	4,731	25.6	74.0	56.4	42.8	31.5	22.4	0.4	66.5	51.3	72.1	76.7	77.1	76.8	78.5
5 to 15..............	12,295	24.7	75.2	59.6	45.4	34.7	25.2	0.1	65.5	44.6	72.4	75.4	78.9	80.0	81.7
16 to 30..............	10,690	25.7	73.9	58.4	45.8	33.9	24.3	0.4	66.2	42.9	74.6	77.7	80.1	80.3	82.6
Over 30	8,464	25.2	74.4	60.5	46.7	37.3	28.1	0.4	62.1	36.1	71.3	74.8	77.5	78.8	80.1
Not specified	3,377	7.2	3.0	1.6	0.5	0.1	0.1	89.8	2.3	5.5	63.1	65.8	64.4	100.0	100.0
Manufacturing process:															
Fabrication/machining .	6,870	27.0	72.7	55.9	42.1	30.6	18.9	0.3	59.2	36.5	67.9	71.2	74.6	75.5	78.3
Assembly.............	5,688	26.6	73.0	55.9	41.9	32.3	24.9	0.4	61.2	36.1	70.8	75.1	76.6	76.5	78.5
Both................	21,016	21.2	78.6	64.1	50.2	38.7	28.8	0.1	70.4	52.3	75.4	78.0	80.5	81.2	82.5
Neither..............	2,619	50.2	48.3	32.3	22.8	16.8	13.1	1.5	44.4	27.9	62.9	71.0	74.8	77.7	79.4
Not specified	3,363	7.0	3.0	2.3	1.1	0.7	0.7	90.0	2.5	6.4	69.0	75.8	73.2	89.4	88.9
Market for most products:															
Consumer	4,451	38.2	61.6	47.1	36.9	28.9	21.1	0.2	60.2	39.5	73.4	74.6	76.1	77.1	75.4
Commercial...........	5,342	23.5	76.4	61.9	48.3	36.2	26.5	0.1	70.6	54.2	75.7	78.0	81.0	82.2	83.0
Industrial	17,861	23.6	76.2	60.1	44.9	32.8	23.1	0.2	65.2	44.7	71.8	75.2	78.3	79.0	81.4
Transportation	3,243	21.7	77.9	65.1	52.9	45.3	35.2	0.4	68.7	39.3	77.3	82.2	83.1	81.8	82.6
Government	2,626	12.6	86.8	71.7	60.9	49.8	38.0	0.6	70.6	43.3	75.0	78.5	79.5	80.3	82.9
Other	2,137	33.4	65.6	46.4	33.3	24.6	18.6	1.1	53.9	34.0	64.9	67.3	71.2	75.0	78.0
Not specified	3,896	11.6	10.4	7.4	5.2	4.1	3.0	78.0	7.0	9.2	56.7	67.1	68.1	68.3	80.2
Market price for most products:															
Less than $5	5,101	32.1	67.8	52.0	40.4	30.3	22.5	0.1	65.3	39.8	77.5	80.4	82.5	83.5	84.7
$5 to $100	9,209	26.3	73.2	56.7	43.1	34.0	25.0	0.5	64.0	41.2	72.6	76.5	78.8	78.1	83.3
$101 to $1,000........	7,843	25.1	74.7	59.7	45.2	33.8	24.1	0.3	64.0	39.0	72.6	75.8	77.9	78.9	79.2
$1,001 to $2,000	2,002	23.2	76.8	60.8	46.9	33.2	24.9	-	63.8	38.7	71.3	73.8	77.6	81.5	85.4
$2,001 to $10,000.....	4,436	26.0	73.8	60.1	44.4	32.6	23.0	0.2	66.2	48.0	72.8	74.4	79.0	80.5	81.6
Over $10,000	6,328	17.9	81.9	66.8	53.3	41.0	30.0	0.2	70.2	59.1	72.7	76.0	78.4	79.7	79.7
Not specified	4,639	13.0	21.3	16.0	13.2	10.9	8.2	65.7	15.3	20.0	59.8	68.9	71.9	71.0	68.2
Products made to military specifications:															
Yes..................	14,588	16.2	83.7	69.0	55.0	44.6	33.4	0.1	71.3	50.0	75.5	78.2	80.5	80.2	82.1
No...................	19,439	31.0	68.6	52.2	38.8	27.6	19.5	0.4	60.7	39.9	70.4	74.6	77.2	78.9	80.0
Don't know	2,141	36.0	63.2	50.0	40.1	28.7	20.4	0.8	59.7	41.7	70.6	69.4	73.1	74.4	78.9
Not specified	3,388	6.1	4.4	3.3	1.7	1.2	1.0	89.5	3.8	13.0	68.3	82.1	100.0	100.0	100.0

Table 1. **Percentage of Establishments Using and Planning to Use Technologies by Characteristic of the Establishment**—Continued

Establishment characteristic	Number of establishments[1]	Minimum number of technologies used (Percent of establishments)							Planning to acquire at least 1 additional technology within 5 years						
		0	1	2	3	4	5	Not specified	Percent of column:						
	(a)	(b)	(c)	(d)	(e)	(f)	(g)		A	B	C	D	E	F	G
Prime defense contractor:															
Yes: Percent of products shipped to defense:															
1 to 25 percent	10,010	18.7	81.2	66.6	52.4	41.3	30.9	0.1	71.9	50.4	77.0	79.0	80.1	80.1	81.3
26 to 75 percent	1,012	10.9	88.9	74.9	63.6	51.0	36.9	0.1	75.3	67.7	76.4	77.4	78.9	76.4	80.4
Over 75 percent.....	683	17.7	80.2	67.4	61.9	52.0	39.6	2.1	65.3	43.3	71.9	75.3	76.6	76.2	78.3
Don't know	601	27.5	72.5	59.3	48.6	38.7	28.9	-	63.1	27.7	76.6	77.1	79.8	82.7	85.2
No..................	22,874	29.1	70.6	54.4	40.8	30.1	21.4	0.3	61.3	40.1	70.3	74.3	77.8	79.1	81.0
Don't know	1,028	25.8	73.5	59.8	46.5	36.9	27.0	0.7	69.0	48.7	76.8	80.3	82.1	84.5	85.0
Not specified	3,349	5.5	4.0	3.1	1.6	1.3	1.3	90.4	2.8	12.5	53.4	64.3	70.1	75.4	74.1
Subcontractor to defense:															
Yes: Percent of products shipped to prime defense contractor:															
1 to 25 percent	11,533	19.5	80.4	67.0	52.8	40.6	30.4	0.2	72.3	53.6	76.9	79.0	81.3	80.4	83.9
26 to 75 percent	2,738	8.5	91.4	74.1	62.5	50.8	37.8	0.1	74.7	54.4	76.6	79.5	80.3	80.9	81.0
Over 75 percent.....	880	13.5	86.4	72.2	58.4	49.6	39.6	0.1	72.9	60.6	74.9	80.6	81.0	84.7	85.5
Don't know	1,830	25.4	73.6	58.9	43.7	34.8	24.7	1.0	62.4	35.6	72.4	74.9	80.2	80.4	79.0
No..................	12,901	34.5	65.1	48.4	36.1	25.7	18.4	0.4	56.3	37.3	66.8	70.9	73.7	76.2	77.9
Don't know	6,070	27.4	72.2	56.2	41.7	31.6	21.7	0.4	64.4	41.1	73.6	76.7	79.0	79.4	78.6
Not specified	3,605	5.8	10.2	8.0	4.7	4.1	3.0	84.0	7.3	15.1	62.5	71.0	83.5	87.3	92.4

Note: Detail percentages for columns "0", "1", and "not specified" under "minimum number of technologies used " may not add to 100 due to independent rounding.

- Represents zero.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

Table 2. Number and Percentage of Establishments Using, Planning, or Not Planning to Use Selected Technologies

Technology	Used in operations		Plan to use within—				Do not plan to use because—						Not specified		Standard error of "Used in operations" (percent)[1]	
			2 years		2-5 years		Not applicable		Not cost effective		Other reasons					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Design and engineering:																
Computer aided design (CAD) or computer aided engineering	15,436	39.0	4,117	10.4	3,641	9.2	8,561	21.6	3,027	7.7	1,435	3.6	3,338	8.4	1.4	0.6
CAD output used to control manufacturing machines	6,680	16.9	3,567	9.0	4,797	12.1	13,440	34.0	5,367	13.6	2,143	5.4	3,562	9.0	2.7	0.5
Digital representation of CAD output used in procurement	3,924	9.9	2,670	6.7	4,283	10.8	16,169	40.9	5,565	14.1	3,206	8.1	3,738	9.5	3.5	0.3
Fabrication/machining and assembly:																
Flexible manufacturing cells or systems	4,217	10.7	1,683	4.3	2,861	7.2	18,199	46.0	5,929	15.0	2,905	7.3	3,764	9.5	3.1	0.3
Numerically controlled or computer numerically controlled machines	16,368	41.4	1,135	2.9	1,966	5.0	11,780	29.8	3,438	8.7	1,437	3.6	3,432	8.7	1.4	0.6
Materials working lasers	1,716	4.3	924	2.3	2,687	6.8	21,183	53.6	6,616	16.7	2,839	7.2	3,591	9.1	4.9	0.2
Pick and place robots	3,057	7.7	1,658	4.2	3,175	8.0	17,554	44.4	8,145	20.6	2,433	6.2	3,534	8.9	2.9	0.2
Other robots	2,246	5.7	1,295	3.3	3,129	7.9	17,969	45.4	8,287	21.0	2,992	7.6	3,639	9.2	3.8	0.2
Automated material handling:																
Automatic storage and retrieval systems	1,252	3.2	616	1.6	1,670	4.2	18,182	46.0	11,857	30.0	2,524	6.4	3,456	8.7	5.0	0.2
Automatic guided vehicle systems	596	1.5	322	0.8	1,190	3.0	20,251	51.2	11,136	28.2	2,607	6.6	3,454	8.7	6.9	0.1
Automated sensor based inspection or testing:																
Performed on incoming or in process materials	3,937	10.0	1,598	4.0	3,111	7.9	16,575	41.9	8,295	21.0	2,510	6.3	3,531	8.9	3.1	0.3
Performed on final product	4,926	12.5	1,786	4.5	3,107	7.9	16,171	40.9	7,661	19.4	2,416	6.1	3,489	8.8	2.8	0.4
Communication and control:																
Local area network for technical data	7,472	18.9	3,608	9.1	3,193	8.1	14,525	36.7	4,173	10.6	2,991	7.6	3,592	9.1	2.2	0.4
Local area network for factory use	6,427	16.2	3,621	9.2	3,919	9.9	14,594	36.9	4,472	11.3	2,922	7.4	3,601	9.1	2.4	0.4
Intercompany computer network linking plant to subcontractors, suppliers, or customers	5,858	14.8	3,135	7.9	4,918	12.4	13,432	34.0	5,499	13.9	3,099	7.8	3,614	9.1	2.6	0.4
Programmable controllers	12,697	32.1	1,823	4.6	2,419	6.1	12,811	32.4	3,926	9.9	2,354	6.0	3,525	8.9	1.6	0.5
Computers used for control on the factory floor	10,785	27.3	4,229	10.7	4,473	11.3	10,318	26.1	4,326	10.9	1,940	4.9	3,485	8.8	1.8	0.5

[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 3. **Number of Establishments by Number of Technologies Used or Planned**

Number of technologies	Number of establishments							Relative standard error of "Currently using" (percent)[1]
	Currently using	Planning to use additional technology within 5 years						
		Number of technologies planned:						
		0	1	2	3–4	5–10	11–17	
0	[2]12,518	[2]8,579	1,240	776	889	966	68	2.3
1	5,629	2,249	639	637	1,017	959	128	3.1
2	4,937	1,612	635	484	929	1,171	106	3.4
3	3,934	935	531	436	848	1,126	58	3.8
4	3,398	858	320	424	756	958	82	4.2
5	2,568	508	301	339	559	814	47	4.5
6	1,916	304	256	287	452	610	7	4.8
7	1,366	238	148	213	345	422	-	5.4
8	983	137	170	129	224	323	-	5.6
9	721	136	89	84	220	192	-	7.2
10	558	110	85	69	173	121	-	7.9
11	379	85	55	44	126	69	-	9.8
12	227	36	48	53	75	15	-	7.5
13	176	49	49	43	35	-	-	12.1
14	100	18	26	36	20	-	-	9.0
15	63	34	16	13	-	-	-	14.1
16	21	9	12	-	-	-	-	14.3
17	57	57	-	-	-	-	-	31.0

[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

[2] Includes 3,141 establishments which did not report. In other tables of this report, these establishments are classified as "Not specified."

Table 4A. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Major Groups 34 to 38

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
MAJOR GROUP 34 Fabricated Metal Products								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	26.8	9.3	10.5	29.2	10.4	4.8	9.1	1.1
CAD output used to control manufacturing machines	13.1	6.4	11.1	38.9	14.6	6.3	9.6	0.8
Digital representation of CAD output used in procurement	6.5	4.7	10.0	45.5	14.6	8.7	10.0	0.6
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	9.0	3.1	7.6	48.1	14.7	7.8	9.8	0.6
Numerically controlled or computer numerically controlled machines	32.2	3.2	5.6	34.2	10.4	5.0	9.4	1.1
Materials working lasers	2.9	1.9	7.0	53.2	17.7	7.5	9.8	0.4
Pick and place robots	5.7	3.7	8.6	45.0	20.6	6.8	9.4	0.4
Other robots	4.4	2.8	8.5	45.2	20.6	8.5	9.9	0.4
Automated material handling:								
Automatic storage and retrieval systems	1.0	0.8	3.4	48.1	30.5	6.8	9.4	0.2
Automatic guided vehicle systems	0.8	0.5	2.8	51.3	27.9	7.1	9.5	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	6.7	3.1	6.6	46.6	20.2	7.3	9.6	0.5
Performed on final product	8.3	3.4	7.6	44.3	19.7	7.2	9.5	0.6
Communication and control:								
Local area network for technical data	13.4	7.1	7.8	41.2	11.8	9.1	9.6	0.8
Local area network for factory use	11.6	8.0	10.0	39.7	12.1	8.8	9.8	0.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers	14.9	7.5	11.3	34.6	13.4	8.7	9.6	0.8
Programmable controllers	26.8	4.9	6.8	33.4	11.0	7.6	9.6	1.0
Computers used for control on the factory floor	21.1	11.3	11.6	28.2	11.7	6.5	9.5	0.9
MAJOR GROUP 35 Industrial Machinery and Equipment								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	43.2	11.6	9.9	18.5	6.5	3.3	7.0	1.1
CAD output used to control manufacturing machines	21.6	11.3	14.0	27.2	13.1	5.1	7.7	1.0
Digital representation of CAD output used in procurement	11.0	7.9	11.9	39.0	14.0	7.8	8.3	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	11.0	4.0	7.5	45.3	15.9	7.4	8.9	0.7
Numerically controlled or computer numerically controlled machines	56.7	2.4	5.6	19.2	6.4	2.3	7.4	1.1
Materials working lasers	3.6	2.3	7.8	53.6	17.4	7.6	7.8	0.4
Pick and place robots	5.8	3.4	6.8	48.3	21.4	6.3	7.9	0.4
Other robots	5.2	2.8	6.8	48.5	21.4	7.4	7.9	0.4
Automated material handling:								
Automatic storage and retrieval systems	3.6	1.6	3.4	50.5	27.5	6.1	7.3	0.4

Table 4A. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Major Groups 34 to 38**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
MAJOR GROUP 35-Con.								
Automated material handling—Con.								
Automatic guided vehicle systems	1.7	1.0	2.3	56.1	25.5	6.2	7.2	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	8.5	3.7	8.1	43.2	22.3	6.4	7.7	0.6
Performed on final product	9.9	4.5	7.8	43.3	20.8	6.1	7.5	0.7
Communication and control:								
Local area network for technical data	18.5	9.3	8.2	38.9	10.1	7.2	7.8	0.8
Local area network for factory use	16.3	8.4	9.4	40.0	10.9	7.0	8.1	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	12.4	7.8	12.9	37.2	14.5	7.1	8.1	0.7
Programmable controllers	33.9	4.7	5.6	33.4	9.5	5.3	7.5	1.1
Computers used for control on the factory floor	28.1	10.1	11.9	27.3	10.9	4.1	7.6	1.0
MAJOR GROUP 36 Electronic and Other Electric Equipment								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	48.5	9.7	7.3	16.3	5.7	2.7	9.9	1.0
CAD output used to control manufacturing machines	16.0	9.3	11.0	36.0	12.6	4.6	10.5	0.8
Digital representation of CAD output used in procurement	12.8	7.6	9.8	38.1	13.6	7.4	10.6	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	11.9	5.7	6.1	45.9	13.4	6.6	10.4	0.6
Numerically controlled or computer numerically controlled machines	34.9	2.9	3.9	36.4	8.5	3.4	10.0	1.0
Materials working lasers	7.5	2.3	5.0	54.9	13.9	6.1	10.3	0.5
Pick and place robots	13.1	6.3	9.3	37.7	18.6	4.9	10.1	0.6
Other robots	6.9	4.7	9.5	41.8	20.0	6.6	10.5	0.4
Automated material handling:								
Automatic storage and retrieval systems	4.9	2.5	5.9	39.4	31.2	6.1	10.1	0.3
Automatic guided vehicle systems	1.8	0.8	4.2	46.0	30.4	6.5	10.3	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	16.2	5.8	8.4	34.3	20.2	5.1	10.1	0.7
Performed on final product	22.2	6.2	7.6	33.0	16.4	4.5	10.1	0.9
Communication and control: Local area network for technical data	24.9	12.4	8.7	27.9	9.4	6.4	10.4	0.9
Local area network for factory use	21.1	12.4	10.6	28.8	10.4	6.6	10.1	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	16.2	9.3	13.0	29.5	13.5	8.2	10.3	0.7
Programmable controllers	38.0	4.3	5.7	28.7	8.4	4.7	10.1	1.0
Computers used for control on the factory floor	34.5	11.1	11.2	20.3	9.3	3.6	9.9	1.0
MAJOR GROUP 37 Transportation Equipment								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	39.9	10.4	7.8	20.7	7.7	4.0	9.5	1.1

Table 4A. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Major Groups 34 to 38**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
MAJOR GROUP 37—Con.								
Design and engineering:—Con.								
CAD output used to control manufacturing machines	16.6	8.7	11.7	35.2	12.1	5.8	9.9	0.8
Digital representation of CAD output used in procurement	10.0	6.7	11.9	38.6	13.1	9.0	10.9	0.8
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	12.6	5.4	7.0	42.5	13.9	7.5	11.1	0.8
Numerically controlled or computer numerically controlled machines	37.3	3.5	3.1	32.3	9.5	4.3	10.0	1.0
Materials working lasers	6.0	3.6	7.7	48.5	16.7	7.2	10.4	0.5
Pick and place robots	10.4	3.6	7.8	41.8	19.7	6.5	10.2	0.6
Other robots	10.5	4.1	6.6	41.7	19.8	7.0	10.3	0.6
Automated material handling:								
Automatic storage and retrieval systems	4.7	2.0	4.5	41.5	29.5	7.4	10.3	0.4
Automatic guided vehicle systems	3.3	1.5	3.5	46.3	28.9	6.7	9.8	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	12.7	3.7	8.4	40.2	18.6	6.3	10.1	0.6
Performed on final product	14.4	3.4	8.3	39.5	17.7	6.2	10.3	0.7
Communication and control:								
Local area network for technical data	22.0	8.0	7.0	35.2	10.0	7.4	10.5	0.9
Local area network for factory use	18.7	8.3	9.6	34.9	11.2	7.2	10.1	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	21.7	7.4	12.7	28.9	12.1	7.0	10.3	1.0
Programmable controllers	32.0	3.5	5.9	31.7	10.6	6.0	10.3	1.0
Computers used for control on the factory floor	27.4	9.1	9.3	27.8	11.2	5.3	9.9	1.0
MAJOR GROUP 38 Instruments and Related Products								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	48.9	11.7	7.3	17.3	5.7	2.0	7.0	1.1
CAD output used to control manufacturing machines	14.6	9.8	11.4	36.8	15.3	4.6	7.6	0.7
Digital representation of CAD output used in procurement	12.5	8.2	10.7	38.9	14.2	7.7	7.8	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	10.8	5.4	7.8	44.5	17.1	7.0	7.4	0.6
Numerically controlled or computer numerically controlled machines	33.6	2.6	4.1	38.6	11.0	3.2	6.9	1.1
Materials working lasers	4.3	3.2	4.7	57.6	16.3	6.5	7.3	0.4
Pick and place robots	8.6	5.2	8.0	43.4	22.7	5.1	6.9	0.5
Other robots	4.4	3.0	7.5	45.9	24.5	7.1	7.6	0.4
Automated material handling:								
Automatic storage and retrieval systems	4.2	2.1	7.0	37.7	36.4	5.5	7.0	0.3
Automatic guided vehicle systems	1.3	0.4	3.5	47.2	34.8	5.9	7.0	0.1
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	12.2	5.7	10.2	36.4	23.1	5.1	7.3	0.7
Performed on final product	15.4	6.3	9.1	36.4	20.6	5.1	7.1	0.8

Table 4A. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Major Groups 34 to 38**—Continued

Technology	Used in operations	Plan to use within: 2 years	Plan to use within: 2-5 years	Do not plan to use because: Not applicable	Do not plan to use because: Not cost effective	Do not plan to use because: Other reasons	Not specified	Absolute standard error of "Used in operations" (percent)[1]
Major Group 38—Con.								
Communication and control:								
Local area network for technical data	25.8	10.6	8.4	31.2	10.8	5.6	7.5	1.0
Local area network for factory use	21.3	10.5	10.4	33.3	11.8	5.3	7.2	0.9
Intercompany computer network linking plant to subcontractors, suppliers, or customers	13.8	7.6	13.3	33.9	16.9	7.3	7.3	0.7
Programmable controllers	32.7	5.2	6.7	33.3	10.0	4.7	7.4	1.0
Computers used for control on the factory floor	32.3	11.5	10.1	23.9	11.3	4.1	6.9	1.1

[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 4B. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Employment Size**

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
EMPLOYMENT SIZE 20 TO 99								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	29.8	10.4	10.5	26.7	9.2	4.2	9.3	0.8
CAD output used to control manufacturing machines	14.0	7.4	10.5	38.1	14.7	5.5	9.8	0.6
Digital representation of CAD output used in procurement	7.5	5.5	9.1	45.6	15.0	7.1	10.2	0.5
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	6.5	2.4	5.7	51.8	15.8	7.3	10.5	0.4
Numerically controlled or computer numerically controlled machines	35.9	2.7	5.4	33.0	9.8	3.7	9.5	0.8
Materials working lasers	2.4	1.5	5.9	56.8	16.8	6.6	9.9	0.3
Pick and place robots	2.7	2.8	6.7	51.0	20.9	6.1	9.8	0.3
Other robots	2.4	2.0	6.0	51.4	21.0	7.2	10.0	0.3
Automated material handling:								
Automatic storage and retrieval systems	1.2	0.8	2.4	52.8	27.6	5.8	9.5	0.2
Automatic guided vehicle systems	0.5	0.4	1.6	57.1	25.2	5.7	9.5	0.1
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	5.8	2.8	6.4	48.0	21.4	6.0	9.7	0.4
Performed on final product	8.0	3.4	6.8	46.3	20.0	5.9	9.6	0.5
Communication and control:								
Local area network for technical data	13.1	7.9	7.2	43.1	11.6	7.4	9.9	0.6
Local area network for factory use	11.0	7.4	8.7	43.2	12.6	7.2	9.9	0.5
Intercompany computer network linking plant to subcontractors, suppliers, or customers	9.7	6.5	10.9	40.3	15.2	7.3	10.1	0.5
Programmable controllers	22.5	4.5	6.1	39.1	11.7	6.3	9.9	0.7
Computers used for control on the factory floor	18.9	9.9	11.5	32.2	12.7	5.1	9.7	0.7
EMPLOYMENT SIZE 100 TO 499								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	54.4	11.7	7.1	12.0	4.9	2.8	7.0	0.7
CAD output used to control manufacturing machines	19.5	11.8	15.9	27.1	12.2	5.8	7.7	0.6
Digital representation of CAD output used in procurement	12.2	9.1	14.2	32.5	13.2	10.6	8.2	0.5
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	16.2	7.5	10.1	36.1	14.4	8.2	7.6	0.5
Numerically controlled or computer numerically controlled machines	50.0	3.6	4.4	24.0	7.0	3.8	7.1	0.7
Materials working lasers	5.8	3.3	8.5	48.5	17.6	8.8	7.5	0.4
Pick and place robots	13.4	6.9	10.9	32.9	21.9	6.7	7.3	0.5
Other robots	8.1	5.6	11.8	35.2	22.8	8.8	7.7	0.4
Automated material handling:								
Automatic storage and retrieval systems	3.7	2.8	7.4	33.8	37.0	7.9	7.4	0.3

Table 4B. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Employment Size**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
EMPLOYMENT SIZE 100 TO 499—Con.								
Automated material handling:—Con.								
Automatic guided vehicle systems	1.7	1.0	4.5	41.2	35.9	8.3	7.4	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	14.2	6.5	11.1	31.4	21.6	7.6	7.5	0.5
Performed on final product	17.4	6.9	10.0	31.6	19.6	7.1	7.5	0.5
Communication and control:								
Local area network for technical data	25.9	11.8	10.7	25.7	9.2	9.0	7.8	0.6
Local area network for factory use	22.9	12.2	13.3	25.9	9.5	8.6	7.7	0.6
Intercompany computer network linking plant to subcontractors, suppliers, or customers	22.7	10.5	15.7	22.0	12.1	9.7	7.3	0.6
Programmable controllers	48.1	5.4	6.8	20.0	6.8	5.8	7.2	0.7
Computers used for control on the factory floor	41.0	13.1	11.9	14.1	7.9	4.9	7.1	0.7
EMPLOYMENT SIZE 500 AND OVER								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	82.6	5.5	2.3	3.0	1.0	0.8	4.9	0.5
CAD output used to control manufacturing machines	39.9	15.6	15.5	14.2	6.1	3.2	5.5	0.6
Digital representation of CAD output used in procurement	29.2	11.5	17.3	20.2	7.1	9.0	5.7	0.6
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	35.9	12.7	12.4	20.3	8.2	4.5	5.9	0.7
Numerically controlled or computer numerically controlled machines	69.8	2.1	2.3	15.7	3.0	1.9	5.2	0.6
Materials working lasers	21.6	7.9	10.3	35.9	11.6	6.9	5.8	0.6
Pick and place robots	43.3	8.9	11.9	14.9	11.6	4.0	5.3	0.7
Other robots	35.0	9.1	13.2	17.7	12.7	6.5	5.9	0.6
Automated material handling:								
Automatic storage and retrieval systems	24.4	5.6	12.2	17.0	28.5	7.1	5.2	0.6
Automatic guided vehicle systems	13.1	4.7	12.8	24.5	29.8	9.8	5.3	0.5
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	41.5	7.9	11.4	14.8	13.5	5.3	5.5	0.7
Performed on final product	44.3	8.1	10.7	15.9	11.1	4.3	5.6	0.7
Communication and control:								
Local area network for technical data	58.6	12.6	7.9	8.2	3.3	4.0	5.4	0.6
Local area network for factory use	50.7	17.6	10.3	8.6	3.3	4.1	5.3	0.7
Intercompany computer network linking plant to subcontractors, suppliers, or customers	41.8	13.2	16.8	10.4	5.9	6.6	5.3	0.7
Programmable controllers	77.8	3.2	3.1	6.3	2.0	2.6	5.1	0.5
Computers used for control on the factory floor	68.0	9.3	7.1	5.1	2.9	2.6	5.0	0.6

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[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 4C. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Age of Plant (Years)

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
LESS THAN 5 YEARS								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	44.4	12.0	9.3	22.5	7.5	3.7	0.7	1.8
CAD output used to control manufacturing machines	17.0	11.2	11.2	41.5	12.7	5.0	1.4	1.5
Digital representation of CAD output used in procurement	11.9	8.8	10.6	47.1	12.4	7.8	1.3	1.1
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	10.7	4.6	7.9	51.6	15.3	8.6	1.2	1.1
Numerically controlled or computer numerically controlled machines	37.3	3.4	5.9	39.1	9.4	4.0	1.0	1.8
Materials working lasers	3.9	2.2	7.6	60.9	15.7	8.3	1.3	0.7
Pick and place robots	4.6	5.6	8.0	51.1	22.2	7.4	1.0	0.7
Other robots	3.7	3.7	7.5	51.9	21.9	9.6	1.6	0.7
Automated material handling:								
Automatic storage and retrieval systems	3.2	1.5	5.5	50.1	31.2	7.6	1.0	0.7
Automatic guided vehicle systems	0.5	0.2	3.5	59.1	28.3	7.3	0.9	0.1
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	10.5	6.4	8.3	44.3	22.6	6.7	1.2	1.0
Performed on final product	14.2	7.0	8.3	42.5	20.8	6.1	1.0	1.2
Communication and control:								
Local area network for technical data	21.3	9.7	6.9	40.1	12.2	8.5	1.3	1.3
Local area network for factory use	18.0	11.1	9.0	39.9	12.9	7.9	1.1	1.3
Intercompany computer network linking plant to subcontractors, suppliers, or customers	11.9	9.7	14.3	38.1	16.3	8.6	1.2	1.0
Programmable controllers	29.5	5.1	8.0	38.2	11.2	6.9	1.0	1.6
Computers used for control on the factory floor	27.3	14.7	11.6	27.9	11.5	6.1	0.9	1.5
5 TO 15 YEARS								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	42.6	11.9	9.7	22.9	7.9	4.6	0.4	1.1
CAD output used to control manufacturing machines	18.1	9.4	14.1	37.0	14.0	6.0	1.4	0.9
Digital representation of CAD output used in procurement	11.4	7.5	11.8	43.9	15.3	8.6	1.6	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	11.7	4.6	7.9	51.1	15.0	8.0	1.7	0.7
Numerically controlled or computer numerically controlled machines	42.3	3.0	5.1	35.3	8.5	4.4	1.1	1.1
Materials working lasers	4.6	2.8	7.3	59.9	17.5	6.9	1.2	0.5
Pick and place robots	7.7	5.2	8.6	49.2	22.2	6.2	1.0	0.5
Other robots	5.1	4.3	8.3	50.4	23.1	7.6	1.2	0.4
Automated material handling:								
Automatic storage and retrieval systems	2.8	2.2	5.0	49.1	33.2	6.5	1.1	0.3

Table 4C. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Age of Plant (Years)**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
5 To 15 YEARS—Con.								
Automated material handling—Con.								
Automatic guided vehicle systems	1.6	1.1	3.7	55.1	31.0	6.6	0.9	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	10.8	4.9	8.1	45.5	22.5	6.8	1.3	0.6
Performed on final product	14.0	5.0	8.0	44.4	20.7	6.7	1.2	0.7
Communication and control:								
Local area network for technical data	21.3	10.9	8.3	38.1	11.6	8.5	1.2	0.9
Local area network for factory use	17.4	10.8	10.7	38.9	12.0	8.7	1.5	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	16.2	9.1	12.8	35.9	16.1	8.3	1.6	0.8
Programmable controllers	34.5	5.6	6.0	35.4	11.1	6.6	1.1	1.0
Computers used for control on the factory floor	29.8	11.7	11.8	27.7	12.1	5.6	1.2	1.0
16 TO 30 YEARS								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	41.3	11.0	11.7	23.0	8.7	3.4	0.8	1.1
CAD output used to control manufacturing machines	19.5	9.2	12.8	35.7	15.4	6.1	1.3	1.0
Digital representation of CAD output used in procurement	9.5	7.3	12.5	44.2	15.4	9.0	2.1	0.6
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	11.2	4.1	7.6	49.2	18.3	7.6	2.0	0.6
Numerically controlled or computer numerically controlled machines	48.0	3.9	5.1	28.3	10.0	3.7	0.9	1.2
Materials working lasers	3.9	2.3	7.8	56.9	19.5	8.2	1.5	0.3
Pick and place robots	8.6	4.0	9.1	46.7	23.1	7.0	1.3	0.5
Other robots	6.3	3.3	9.1	47.8	23.5	8.4	1.6	0.5
Automated material handling:								
Automatic storage and retrieval systems	3.3	1.3	4.1	50.3	33.0	7.3	0.8	0.3
Automatic guided vehicle systems	1.4	0.9	2.8	55.1	31.7	7.3	0.9	0.1
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	10.5	3.4	10.0	45.3	22.7	7.1	1.1	0.6
Performed on final product	13.2	4.5	9.6	44.0	20.8	7.0	0.9	0.7
Communication and control:								
Local area network for technical data	19.4	9.9	10.0	40.3	10.7	8.0	1.7	0.8
Local area network for factory use	17.1	9.8	11.7	39.8	12.2	7.9	1.5	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	16.6	8.1	14.4	35.9	14.4	9.3	1.4	0.8
Programmable controllers	34.9	5.3	7.4	33.9	10.6	6.4	1.6	1.1
Computers used for control on the factory floor	29.0	12.0	14.7	27.1	11.4	4.7	1.1	1.0
OVER 30 YEARS								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	43.1	10.4	8.7	23.6	9.1	3.7	1.5	1.2

Table 4C. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Age of Plant (Years)—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
OVER 30 YEARS—Con.								
Design and engineering—Con.								
CAD output used to control manufacturing machines	18.3	10.3	13.7	34.1	16.4	5.9	1.3	0.9
Digital representation of CAD output used in procurement	11.0	6.3	11.6	42.6	16.9	9.5	2.0	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	12.6	5.4	8.3	46.7	16.5	8.0	2.5	0.6
Numerically controlled or computer numerically controlled machines	50.0	2.2	5.7	27.7	10.2	3.4	0.7	1.2
Materials working lasers	6.6	2.7	7.0	54.4	19.2	8.3	1.7	0.5
Pick and place robots	11.5	3.9	8.9	45.5	22.1	6.4	1.7	0.5
Other robots	9.1	2.8	9.1	46.9	22.2	8.1	1.9	0.4
Automated material handling:								
Automatic storage and retrieval systems	4.7	1.7	4.1	48.9	32.5	6.7	1.0	0.3
Automatic guided vehicle systems	2.6	0.9	3.2	53.8	30.4	7.6	1.4	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	11.7	3.7	7.6	45.2	23.6	6.9	1.3	0.7
Performed on final product	13.2	4.2	8.1	44.8	22.0	6.4	1.3	0.7
Communication and control:								
Local area network for technical data	20.7	8.7	8.9	40.5	11.9	8.0	1.4	0.9
Local area network for factory use	18.7	8.4	10.7	40.8	12.6	7.3	1.4	0.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	18.0	8.1	13.0	37.6	14.1	7.9	1.4	0.8
Programmable controllers	39.0	3.8	5.9	33.8	10.4	6.1	0.9	1.1
Computers used for control on the factory floor	32.1	9.5	10.6	29.1	12.5	5.1	1.1	1.1

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[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 4D. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Manufacturing Process**

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
FABRICATION/ MACHINERY								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	31.1	10.1	10.7	31.4	10.9	5.0	0.8	1.6
CAD output used to control manufacturing machines	21.5	9.3	9.7	37.7	13.6	6.8	1.4	1.5
Digital representation of CAD output used in procurement	9.3	4.7	9.7	50.8	15.0	8.5	2.0	1.0
Fabrication/ machining and assembly:								
Flexible manufacturing cells or systems	9.6	3.1	8.1	54.1	15.3	7.8	1.9	0.9
Numerically controlled or computer numerically controlled machines	53.5	3.1	5.5	23.1	9.8	4.0	1.1	1.7
Materials working lasers	3.4	2.6	6.1	59.5	18.4	8.1	1.9	0.5
Pick and place robots	4.1	4.0	6.4	55.2	21.4	7.6	1.4	0.1
Other robots	3.7	2.8	6.0	55.7	21.2	8.7	1.9	0.5
Automated material handling:								
Automatic storage and retrieval systems	1.4	0.8	2.3	56.5	30.4	7.1	1.5	0.3
Automatic guided vehicle systems	1.0	0.8	2.4	61.2	26.6	7.2	0.8	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	8.8	4.7	6.9	47.3	24.0	6.8	1.5	0.9
Performed on final product	11.8	5.2	8.7	43.4	23.1	6.5	1.4	1.0
Communication and control:								
Local area network for technical data	13.7	8.0	7.8	46.3	13.0	8.9	2.0	1.1
Local area network for factory use	12.2	10.1	9.6	43.8	14.5	8.0	1.7	1.0
Intercompany computer network linking plant to subcontractors, suppliers, or customers	14.6	8.5	12.1	38.9	16.5	7.8	1.7	1.1
Programmable controllers	31.2	6.3	6.4	35.5	12.0	7.5	1.1	1.6
Computers used for control on the factory floor	24.7	12.2	11.7	29.4	14.7	6.3	1.0	1.4
ASSEMBLY								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	49.9	9.1	7.1	24.1	6.4	2.5	0.9	1.3
CAD output used to control manufacturing machines	10.6	6.8	8.2	54.5	14.2	4.1	1.6	0.7
Digital representation of CAD output used in procurement	13.3	7.0	9.2	48.8	13.9	6.5	1.5	0.7
Fabrication/ machining and assembly:								
Flexible manufacturing cells or systems	11.8	4.6	5.5	58.7	13.2	4.8	1.3	0.8
Numerically controlled or computer numerically controlled machines	15.1	2.6	2.7	63.4	10.7	4.1	1.3	0.8
Materials working lasers	4.2	1.9	3.0	72.0	12.7	4.9	1.3	0.4
Pick and place robots	11.2	5.9	8.7	48.6	20.3	4.2	1.1	0.7
Other robots	5.9	4.5	7.4	54.1	21.0	5.7	1.3	0.4
Automated material handling:								
Automatic storage and retrieval systems	5.1	2.7	6.6	44.8	34.3	5.4	1.1	0.4

Table 4D. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Manufacturing Process**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
ASSEMBLY—Con.								
Automated materials handling:—Con.								
Automatic guided vehicle systems ...	2.3	1.2	4.3	53.6	32.4	5.2	1.1	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	13.1	5.2	9.0	44.8	22.1	4.5	1.1	0.7
Performed on final product	17.4	5.8	7.1	44.8	19.4	4.2	1.3	0.8
Communication and control:								
Local area network for technical data	26.2	12.3	7.6	36.8	10.2	5.5	1.3	1.0
Local area network for factory use ...	22.5	10.3	9.7	39.8	11.1	5.4	1.1	1.0
Intercompany computer network linking plant to subcontractors, suppliers, or customers	18.3	8.4	14.1	36.3	15.4	6.2	1.3	1.0
Programmable controllers	30.5	3.8	6.4	45.7	10.2	5.0	1.3	1.1
Computers used for control on the factory floor	32.6	10.9	9.0	30.9	11.9	3.8	0.9	1.1
FABRICATION/MACHINERY AND ASSEMBLY								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	47.2	13.0	11.5	15.6	8.1	4.0	0.7	0.8
CAD output used to control manufacturing machines	20.8	11.6	16.8	27.2	16.2	6.2	1.1	0.7
Digital representation of CAD output used in procurement...............	11.1	8.7	14.2	37.5	16.8	10.1	1.7	0.5
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems.........................	13.2	5.5	8.9	42.2	18.8	9.2	2.1	0.5
Numerically controlled or computer numerically controlled machines	55.0	3.4	6.4	21.0	9.6	3.8	0.7	0.8
Materials working lasers	5.5	2.8	9.6	50.7	21.3	8.8	1.2	0.3
Pick and place robots	9.6	4.6	10.0	45.6	24.8	7.3	1.1	0.4
Other robots.......................	7.5	3.8	9.9	43.0	25.3	9.2	1.4	0.3
Automated material handling:								
Automatic storage and retrieval systems.........................	3.9	1.8	4.9	46.4	34.6	7.6	0.9	0.2
Automatic guided vehicle systems ...	1.8	0.9	3.4	51.8	33.3	8.0	0.9	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	11.4	4.3	9.2	42.1	24.2	7.8	1.1	0.5
Performed on final product	13.8	4.7	9.0	41.8	22.2	7.5	0.9	0.5
Communication and control:								
Local area network for technical data	21.8	10.2	9.8	36.4	11.7	8.8	1.2	0.6
Local area network for factory use ...	18.8	10.0	12.0	36.7	12.3	8.8	1.3	0.6
Intercompany computer network linking plant to subcontractors, suppliers, or customers	16.6	9.0	14.4	33.9	15.0	9.8	1.3	0.6
Programmable controllers	38.7	4.9	6.9	30.6	11.0	6.7	1.1	0.8
Computers used for control on the factory floor	32.1	11.9	13.6	24.4	11.4	5.4	1.1	0.7

Table 4D. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Manufacturing Process**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
NEITHER FABRICATION/MACHINERY NOR ASSEMBLY								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	18.5	6.3	2.5	59.4	7.6	3.2	2.5	1.6
CAD output used to control manufacturing machines	7.8	3.4	4.9	69.4	7.6	4.1	2.9	1.3
Digital representation of CAD output used in procurement	7.0	4.0	3.8	70.1	7.5	4.1	3.5	1.2
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	3.8	1.8	4.0	78.0	6.2	4.2	2.0	0.6
Numerically controlled or computer numerically controlled machines	9.6	2.2	2.9	74.7	4.6	3.3	2.6	1.2
Materials working lasers	2.9	1.5	2.9	80.4	5.5	4.1	2.7	0.6
Pick and place robots	4.6	3.6	4.4	69.7	11.2	4.2	2.5	0.9
Other robots	2.5	1.8	7.6	69.0	12.1	4.2	2.8	0.6
Automated material handling:								
Automatic storage and retrieval systems	2.0	0.8	3.6	68.4	19.2	4.3	1.7	0.7
Automatic guided vehicle systems	0.7	0.5	2.1	73.4	16.8	3.8	2.7	0.1
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	6.4	2.4	6.6	66.2	11.1	4.6	2.6	0.9
Performed on final product	8.4	3.6	8.0	63.2	10.3	4.6	2.0	1.1
Communication and control:								
Local area network for technical data	15.9	6.6	6.0	53.7	8.4	7.2	2.0	1.6
Local area network for factory use	12.1	8.6	6.5	54.1	8.9	7.1	2.7	1.4
Intercompany computer network linking plant to subcontractors, suppliers, or customers	11.9	6.8	9.0	52.4	12.3	4.8	2.8	1.3
Programmable controllers	24.6	4.8	6.2	49.9	7.4	4.6	2.6	1.9
Computers used for control on the factory floor	17.4	9.5	11.3	45.9	8.7	4.7	2.5	1.6

[1] A description of the standard error of estimate is given in Appendix C,"Sampling and Estimating Methodology."

Table 4E. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market for Most Products

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
CONSUMER								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	27.6	10.5	8.4	34.5	12.6	5.5	0.8	1.2
CAD output used to control manufacturing machines	9.7	6.3	10.7	46.7	19.0	6.4	1.3	0.9
Digital representation of CAD output used in procurement	8.8	4.9	9.3	50.5	16.7	8.5	1.2	0.8
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	11.8	4.3	8.2	52.2	14.4	7.2	1.9	0.8
Numerically controlled or computer numerically controlled machines	23.9	4.4	6.8	46.4	12.6	4.8	1.2	1.3
Materials working lasers	3.6	1.9	6.7	61.1	18.7	6.7	1.2	0.5
Pick and place robots	12.5	5.6	8.7	44.8	22.0	5.0	1.3	0.8
Other robots	7.3	5.1	9.9	45.7	24.4	6.3	1.3	0.6
Automated material handling:								
Automatic storage and retrieval systems	2.7	2.0	5.4	48.2	34.6	6.2	0.9	0.4
Automatic guided vehicle systems	1.9	1.0	5.2	52.7	32.2	6.2	0.8	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	10.2	4.5	7.5	46.3	24.2	6.7	0.7	0.9
Performed on final product	11.0	6.1	7.8	46.1	21.4	6.6	1.0	0.8
Communication and control:								
Local area network for technical data	16.1	8.4	7.0	46.9	12.7	7.8	1.2	1.0
Local area network for factory use	17.2	8.8	9.6	43.4	12.9	7.3	0.8	1.1
Intercompany computer network linking plant to subcontractors, suppliers, or customers	17.5	9.4	12.8	38.0	14.3	7.2	0.9	1.1
Programmable controllers	34.5	4.0	6.4	35.9	12.2	5.9	1.1	1.4
Computers used for control on the factory floor	27.1	11.7	11.1	31.2	13.3	4.8	0.9	1.3
COMMERCIAL								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	49.1	11.6	12.0	17.5	6.8	2.5	0.6	1.5
CAD output used to control manufacturing machines	19.3	11.9	12.6	37.2	12.4	5.2	1.4	1.1
Digital representation of CAD output used in procurement	13.2	8.6	14.8	40.9	13.2	7.6	1.8	0.8
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	13.8	5.7	9.4	46.6	16.2	7.1	1.3	1.0
Numerically controlled or computer numerically controlled machines	41.7	2.1	4.7	37.2	9.0	4.5	0.9	1.5
Materials working lasers	5.2	3.2	6.7	56.0	21.5	6.2	1.2	0.7
Pick and place robots	8.7	4.5	10.1	43.5	35.8	5.9	1.6	0.6
Other robots	5.7	3.2	10.9	44.7	36.8	7.0	1.7	0.5
Automated material handling:								
Automatic storage and retrieval systems	4.5	1.9	6.9	42.4	37.1	6.4	0.9	0.5

Table 4E. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market for Most Products**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
COMMERCIAL—Con.								
Automated material handling—Con.								
Automatic guided vehicle systems	2.0	0.9	4.7	49.2	35.3	7.1	0.8	0.4
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	11.5	5.0	8.9	42.4	25.4	5.7	1.0	0.8
Performed on final product	14.4	4.8	8.4	42.9	22.9	5.6	1.1	0.9
Communication and control:								
Local area network for technical data	24.4	9.8	9.7	35.4	11.9	7.5	1.3	1.1
Local area network for factory use	22.0	9.6	10.4	36.0	13.7	7.2	1.2	1.1
Intercompany computer network linking plant to subcontractors, suppliers, or customers	16.4	8.7	16.6	33.7	15.6	8.2	0.8	1.0
Programmable controllers	34.3	5.7	7.9	33.3	11.1	6.1	1.5	1.4
Computers used for control on the factory floor	33.0	9.7	12.5	26.5	11.9	5.0	1.4	1.3
INDUSTRIAL								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	42.8	12.2	10.7	21.5	8.2	3.8	0.9	1.0
CAD output used to control manufacturing machines	18.7	10.1	14.7	34.1	15.6	5.6	1.2	0.8
Digital representation of CAD output used in procurement	9.7	7.6	11.6	44.5	16.2	8.6	1.9	0.6
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	9.9	4.0	7.5	51.4	17.7	7.7	1.9	0.5
Numerically controlled or computer numerically controlled machines	49.5	3.1	5.7	27.9	9.6	3.4	0.8	1.0
Materials working lasers	4.2	2.1	7.6	58.5	18.6	7.8	1.4	0.4
Pick and place robots	6.2	4.1	8.2	51.2	22.4	6.8	1.1	0.3
Other robots	4.5	3.1	7.8	52.2	22.6	8.5	1.5	0.3
Automated material handling:								
Automatic storage and retrieval systems	2.7	1.4	3.8	53.8	30.9	6.4	1.1	0.2
Automatic guided vehicle systems	1.2	0.8	2.4	59.1	28.8	6.8	0.8	0.2
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	9.2	3.8	8.5	47.1	23.3	6.9	1.2	0.5
Performed on final product	12.1	4.7	8.5	45.2	21.9	6.6	0.9	0.6
Communication and control:								
Local area network for technical data	19.1	10.0	8.8	40.2	12.1	8.3	1.5	0.7
Local area network for factory use	15.9	9.7	11.3	41.0	12.7	8.1	1.3	0.7
Intercompany computer network linking plant to subcontractors, suppliers, or customers	13.6	8.7	13.5	37.5	16.5	8.7	1.5	0.6
Programmable controllers	34.5	5.1	6.5	35.6	10.9	6.4	1.0	0.9
Computers used for control on the factory floor	27.6	12.3	12.7	28.5	12.8	5.1	0.9	0.8
GOVERNMENT								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	57.0	10.4	7.5	15.7	5.3	3.4	0.7	2.3

Table 4E. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market for Most Products—Continued

Technology	Used in operations	Plan to use within: 2 years	Plan to use within: 2-5 years	Do not plan to use because: Not applicable	Do not plan to use because: Not cost effective	Do not plan to use because: Other reasons	Not specified	Absolute standard error of "Used in operations" (percent)[1]
GOVERNMENT—Con.								
Design and engineering—Con.								
CAD output used to control manufacturing machines	30.1	9.2	13.2	29.6	12.2	3.9	1.7	2.1
Digital representation of CAD output used in procurement	17.8	9.4	13.7	34.3	14.6	8.3	1.9	1.8
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	12.7	5.0	9.0	47.5	15.8	7.8	2.1	1.4
Numerically controlled or computer numerically controlled machines	62.0	1.8	3.7	24.7	4.7	2.3	0.8	2.1
Materials working lasers	10.4	4.0	11.2	53.4	12.9	6.7	1.5	1.1
Pick and place robots	10.1	6.2	9.1	46.6	21.8	5.2	1.0	0.9
Other robots	8.4	3.1	8.5	49.5	22.6	6.7	1.3	1.0
Automated material handling:								
Automatic storage and retrieval systems	5.9	2.4	4.7	74.2	36.1	5.8	1.0	0.8
Automatic guided vehicle systems	2.0	1.3	3.0	51.8	35.1	5.7	1.0	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	19.2	7.0	10.1	35.8	21.3	4.6	2.1	1.4
Performed on final product	23.0	6.5	8.6	37.5	19.1	4.3	1.0	1.7
Communication and control:								
Local area network for technical data	28.8	12.7	11.3	30.4	10.6	4.9	1.3	1.9
Local area network for factory use	22.8	13.2	11.4	32.9	12.2	5.9	1.6	1.8
Intercompany computer network linking plant to subcontractors, suppliers, or customers	13.9	8.1	15.5	36.4	16.2	8.6	1.3	1.5
Programmable controllers	39.4	5.1	8.0	30.4	11.6	4.1	1.5	2.2
Computers used for control on the factory floor	41.0	12.8	11.5	19.6	9.6	4.1	1.5	2.2
TRANSPORTATION								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	45.7	12.3	7.4	23.1	7.7	3.3	0.5	1.8
CAD output used to control manufacturing machines	19.7	13.0	13.8	34.6	11.7	6.0	1.2	1.5
Digital representation of CAD output used in procurement	10.5	8.8	13.0	42.3	13.8	9.9	1.9	0.9
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	18.0	7.3	8.7	41.3	15.4	6.8	2.4	1.3
Numerically controlled or computer numerically controlled machines	47.9	4.9	5.8	26.3	9.9	3.4	1.7	1.8
Materials working lasers	5.1	4.3	8.8	55.6	17.0	7.2	2.0	0.7
Pick and place robots	16.1	6.6	10.2	38.0	21.0	6.6	1.5	1.2
Other robots	12.8	6.8	9.4	40.4	20.0	8.6	2.0	1.0
Automated material handling:								
Automatic storage and retrieval systems	5.5	2.4	4.8	43.8	33.7	8.5	1.4	0.7
Automatic guided vehicle systems	2.8	1.2	4.4	49.1	32.4	8.5	1.6	0.6

Table 4E. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market for Most Products**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
TRANSPORTATION—Con.								
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	15.4	6.3	10.8	39.6	18.3	7.7	2.0	1.1
Performed on final product	20.0	5.6	11.9	37.6	16.0	7.0	1.8	1.3
Communication and control:								
Local area network for technical data	24.8	12.2	10.4	34.0	8.7	8.5	1.4	1.4
Local area network for factory use	20.4	14.4	11.2	34.1	10.1	7.9	1.9	1.3
Intercompany computer network linking plant to subcontractors, suppliers, or customers	32.6	10.4	11.8	27.0	9.5	6.9	1.8	1.6
Programmable controllers	44.3	6.6	6.2	27.8	8.3	5.3	1.5	1.8
Computers used for control on the factory floor	34.5	13.4	14.1	22.8	8.6	5.4	1.2	1.6
OTHER MARKETS								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	36.6	6.9	11.3	27.9	10.5	4.7	2.2	2.4
CAD output used to control manufacturing machines	16.7	5.3	9.4	41.8	14.8	9.8	2.2	2.2
Digital representation of CAD output used in procurement	10.9	4.4	8.7	46.6	14.4	12.3	2.6	1.6
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	10.7	3.5	5.8	49.8	12.1	15.3	2.9	1.5
Numerically controlled or computer numerically controlled machines	36.9	3.2	4.0	38.0	9.3	7.2	1.4	2.6
Materials working lasers	3.5	2.0	4.2	58.4	15.4	14.7	1.8	0.6
Pick and place robots	4.5	2.0	7.2	52.7	20.0	11.7	1.9	0.5
Other robots	6.7	1.7	5.5	52.2	18.2	13.7	1.9	1.3
Automated material handling:								
Automatic storage and retrieval systems	3.0	1.0	3.9	49.1	28.4	12.9	1.6	0.6
Automatic guided vehicle systems	1.5	0.5	2.3	56.5	25.1	11.8	2.3	0.4
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	6.9	2.6	5.8	50.7	21.0	11.4	1.6	1.1
Performed on final product	7.7	2.8	7.0	48.7	20.7	11.0	2.0	1.1
Communication and control:								
Local area network for technical data	16.7	7.5	6.3	45.0	9.0	12.9	2.6	1.8
Local area network for factory use	13.3	6.6	10.9	44.1	9.3	12.6	3.2	1.6
Intercompany computer network linking plant to subcontractors, suppliers, or customers	12.2	5.9	10.2	43.1	12.2	12.9	3.5	1.6
Programmable controllers	24.5	3.4	5.6	41.7	9.5	12.9	2.4	2.2
Computers used for control on the factory floor	24.0	8.2	10.9	34.6	10.7	9.6	2.1	2.2

[1] A description of the standard error of estimate is given in Appendix C,"Sampling and Estimating Methodology."

Table 4F. Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market Price for Most Products

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
LESS THAN $5								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	28.6	10.4	10.2	34.7	11.3	4.4	0.4	1.4
CAD output used to control manufacturing machines	11.0	8.1	11.6	44.5	18.9	5.5	0.5	1.0
Digital representation of CAD output used in procurement	6.1	6.9	8.5	51.4	18.6	7.4	1.1	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	12.2	5.0	6.4	53.2	14.9	7.0	1.3	0.9
Numerically controlled or computer numerically controlled machines	29.0	4.0	7.5	41.2	13.9	4.0	0.2	1.4
Materials working lasers	4.3	1.2	5.1	64.1	18.0	6.6	0.6	0.6
Pick and place robots	13.3	7.1	10.9	40.0	21.6	6.4	0.7	0.9
Other robots	5.0	4.8	9.7	45.5	24.4	9.0	1.5	0.5
Automated material handling:								
Automatic storage and retrieval systems	1.3	1.1	4.2	47.7	38.4	6.7	0.4	0.2
Automatic guided vehicle systems	0.9	0.6	3.6	52.7	34.8	6.8	0.5	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	12.1	6.6	10.3	40.2	23.6	6.2	0.9	0.9
Performed on final product	14.9	6.8	12.8	36.5	22.0	6.2	0.8	1.0
Communication and control:								
Local area network for technical data	16.7	8.7	8.4	41.8	14.8	8.9	0.7	1.1
Local area network for factory use	15.1	10.3	11.9	40.0	13.9	8.2	0.6	1.0
Intercompany computer network linking plant to subcontractors, suppliers, or customers	21.5	9.3	12.5	33.3	14.3	8.3	0.8	1.2
Programmable controllers	39.3	4.8	8.2	29.0	11.8	6.0	0.9	1.5
Computers used for control on the factory floor	26.4	14.5	15.2	25.0	13.7	5.0	0.2	1.3
$5 TO $100								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	33.3	11.3	9.6	29.3	10.2	5.5	0.8	1.2
CAD output used to control manufacturing machines	17.3	10.1	12.5	38.7	13.3	7.0	1.1	1.1
Digital representation of CAD output used in procurement	8.8	6.8	9.6	48.7	14.3	10.0	1.7	0.7
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	13.2	5.1	8.1	46.9	15.8	9.0	1.8	0.8
Numerically controlled or computer numerically controlled machines	45.1	3.3	5.7	32.0	8.0	4.8	1.0	1.3
Materials working lasers	4.6	2.7	6.8	57.2	18.2	8.9	1.6	0.5
Pick and place robots	12.2	6.0	10.2	42.2	21.4	6.9	1.2	0.6
Other robots	7.5	5.0	10.3	44.8	22.9	8.1	1.4	0.5
Automated material handling:								
Automatic storage and retrieval systems	2.4	2.4	4.9	47.3	33.8	7.9	1.3	0.3
Automatic guided vehicle systems	1.1	1.3	4.6	54.0	31.7	6.4	1.0	0.2

Table 4F. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market Price for Most Products**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
$5 to $100—Con.								
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	11.0	5.5	9.5	41.7	22.7	8.3	1.2	0.7
Performed on final product	14.6	6.4	9.1	39.2	21.3	8.3	1.2	0.8
Communication and control:								
Local area network for technical data	16.4	10.8	8.8	41.0	10.5	10.7	1.7	0.8
Local area network for factory use	17.7	10.5	10.7	38.3	11.7	10.0	1.2	0.9
Intercompany computer network linking plant to subcontractors, suppliers, or customers	19.0	8.9	12.5	35.9	13.7	8.6	1.3	0.9
Programmable controllers	35.7	5.1	7.0	33.4	10.0	7.4	1.3	1.2
Computers used for control on the factory floor	29.9	11.8	13.7	25.5	11.1	6.7	1.3	1.1
$101 TO $1,000								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	41.0	11.2	11.3	24.9	7.3	3.6	0.7	1.4
CAD output used to control manufacturing machines	19.3	10.3	13.6	36.5	14.1	4.9	1.4	1.2
Digital representation of CAD output used in procurement	9.6	6.1	12.4	47.4	14.4	8.6	1.5	0.8
Fabrication/ machining and assembly:								
Flexible manufacturing cells or systems	10.3	4.6	9.7	50.4	16.6	6.6	1.7	0.7
Numerically controlled or computer numerically controlled machines	51.5	3.0	4.5	29.2	8.0	2.9	0.9	1.5
Materials working lasers	5.2	3.2	8.4	57.2	17.7	7.2	1.2	0.6
Pick and place robots	6.4	4.4	9.8	48.6	23.1	6.7	1.1	0.5
Other robots	6.0	3.3	9.0	50.1	22.0	8.3	1.3	0.5
Automated material handling:								
Automatic storage and retrieval systems	2.7	1.3	4.6	49.9	34.4	6.5	0.7	0.3
Automatic guided vehicle systems	1.8	0.6	2.7	56.5	31.0	6.7	0.8	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	11.1	3.7	8.5	46.8	22.8	6.1	1.0	0.8
Performed on final product	13.8	4.3	8.5	46.3	20.5	5.8	0.8	0.9
Communication and control:								
Local area network for technical data	20.0	9.9	7.7	41.8	11.9	7.5	1.2	1.0
Local area network for factory use	16.1	10.0	9.9	43.2	12.3	7.3	1.2	0.9
Intercompany computer network linking plant to subcontractors, suppliers, or customers	13.7	8.9	14.1	39.8	13.9	8.7	0.9	0.9
Programmable controllers	31.6	5.2	6.8	38.9	10.3	6.5	0.7	1.3
Computers used for control on the factory floor	29.6	13.0	12.1	29.7	10.5	4.5	0.6	1.2
$1,001 TO $2,000								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	50.2	10.8	9.5	18.5	7.6	3.4	-	2.8
CAD output used to control manufacturing machines	16.7	11.5	13.9	32.2	17.8	7.7	0.3	2.0

Table 4F. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market Price for Most Products**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
$1,001 TO $2,000—Con.								
Design and engineering:—Con.								
Digital representation of CAD output used in procurement	13.1	7.6	12.3	38.8	16.7	10.9	0.5	2.0
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	9.2	5.3	8.8	47.8	20.6	7.2	1.1	1.2
Numerically controlled or computer numerically controlled machines	49.2	2.3	5.0	28.2	9.2	4.2	1.7	2.8
Materials working lasers	3.2	1.6	10.1	55.2	22.5	7.0	0.4	1.1
Pick and place robots	3.6	4.8	10.8	45.2	27.3	8.0	0.2	0.6
Other robots	3.6	2.9	8.9	46.2	28.1	9.3	1.1	0.6
Automated material handling:								
Automatic storage and retrieval systems	4.5	2.1	7.6	46.5	31.9	7.2	0.2	1.1
Automatic guided vehicle systems	1.5	1.5	4.9	51.5	33.0	7.2	0.3	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	12.2	4.3	9.5	42.8	25.4	5.5	0.2	1.5
Performed on final product	13.6	6.2	9.0	42.2	23.4	5.2	0.5	1.6
Communication and control:								
Local area network for technical data	22.1	10.1	10.8	37.7	12.6	6.6	0.2	2.1
Local area network for factory use	18.5	11.3	11.2	37.4	14.3	6.8	0.4	2.0
Intercompany computer network linking plant to subcontractors, suppliers, or customers	14.1	7.0	16.0	33.1	19.5	9.8	0.5	1.8
Programmable controllers	32.1	4.7	6.9	34.9	14.5	6.7	0.2	2.4
Computers used for control on the factory floor	30.5	10.2	9.5	26.5	17.6	5.7	0.1	2.4
$2,001 TO $10,000								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	50.9	12.4	10.1	15.5	8.2	1.9	0.9	1.9
CAD output used to control manufacturing machines	18.9	10.4	15.7	33.5	14.7	6.1	0.7	1.4
Digital representation of CAD output used in procurement	12.5	7.9	15.3	37.5	16.6	8.6	1.6	1.1
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	9.8	3.9	7.7	49.6	17.7	9.6	1.7	1.0
Numerically controlled or computer numerically controlled machines	45.0	2.4	5.5	31.0	10.8	4.6	0.6	1.9
Materials working lasers	3.2	2.2	6.9	58.3	20.1	8.0	1.4	0.4
Pick and place robots	4.5	2.9	6.3	51.8	26.7	6.9	0.8	0.4
Other robots	4.5	2.1	6.8	51.0	26.7	8.0	1.1	0.5
Automated material handling:								
Automatic storage and retrieval systems	3.4	1.0	3.6	49.3	34.0	7.8	0.9	0.8
Automatic guided vehicle systems	1.5	1.0	2.0	54.3	32.5	7.6	1.1	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	9.1	3.4	6.9	46.3	26.5	7.0	0.8	0.8
Performed on final product	12.1	3.3	6.7	47.1	23.6	6.4	0.9	1.0

Table 4F. **Percent of Establishments Using, Planning, or Not Planning to Use Selected Technologies by Market Price for Most Products**—Continued

Technology	Used in operations	Plan to use within:		Do not plan to use because:			Not specified	Absolute standard error of "Used in operations" (percent)[1]
		2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
$2,001 TO $10,000—Con.								
Communication and control:								
Local area network for technical data	22.0	9.4	10.9	35.7	12.8	7.5	1.6	1.4
Local area network for factory use	17.4	8.9	13.0	37.4	13.8	7.6	1.9	1.2
Intercompany computer network linking plant to subcontractors, suppliers, or customers	11.8	7.7	14.6	36.5	18.6	8.8	2.0	1.0
Programmable controllers	28.0	5.6	7.2	37.7	12.5	7.3	1.8	1.6
Computers used for control on the factory floor	30.7	9.5	11.5	29.4	12.9	4.9	1.1	1.6
OVER $10,000								
Design and engineering:								
Computer aided design (CAD) or computer aided engineering	61.8	13.0	9.2	6.9	5.5	2.6	0.9	1.5
CAD output used to control manufacturing machines	23.4	10.2	13.9	30.6	15.3	5.2	1.5	1.2
Digital representation of CAD output used in procurement	15.8	10.3	14.9	33.4	15.5	8.4	1.7	1.0
Fabrication/machining and assembly:								
Flexible manufacturing cells or systems	12.0	4.4	6.2	49.7	17.7	8.0	2.1	0.8
Numerically controlled or computer numerically controlled machines	48.8	3.2	4.4	29.5	9.3	3.6	1.2	1.4
Materials working lasers	5.8	3.3	9.2	53.8	18.4	8.0	1.6	0.5
Pick and place robots	6.8	2.4	5.5	55.7	21.8	6.3	1.5	0.6
Other robots	7.7	2.7	6.5	52.3	21.3	7.7	1.9	0.6
Automated material handling:								
Automatic storage and retrieval systems	6.7	2.2	4.7	52.1	27.1	5.7	1.5	0.5
Automatic guided vehicle systems	3.1	0.8	2.6	58.9	26.7	6.4	1.5	0.3
Automated sensor based inspection or testing:								
Performed on incoming or in process materials	10.3	2.9	7.4	49.1	22.0	6.6	1.7	0.6
Performed on final product	11.9	3.1	6.1	50.6	20.8	6.2	1.3	0.8
Communication and control:								
Local area network for technical data	29.9	11.1	8.8	33.1	9.5	6.2	1.4	1.2
Local area network for factory use	21.8	10.3	10.7	37.2	11.5	6.8	1.7	1.0
Intercompany computer network linking plant to subcontractors, suppliers, or customers	14.4	9.0	14.0	35.5	16.2	8.5	2.0	0.9
Programmable controllers	39.8	5.1	4.6	33.2	10.4	5.2	1.7	1.4
Computers used for control on the factory floor	31.9	11.0	10.6	28.2	11.9	5.1	1.3	1.2

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[1] A description of the standard error of estimate is given in Appendix C,"Sampling and Estimating Methodology."

Table 5A. Percentage of Establishments Using, Planning, or Not Planning to Use: Computer Aided Design (CAD) or Computer Aided Engineering

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	39.0	10.4	9.2	21.6	7.7	3.6	8.4	0.6
Major Group:									
34, Fabricated Metal Products	12,746	26.8	9.3	10.5	29.2	10.4	4.8	9.1	1.1
35, Industrial Machinery and Equipment	13,176	43.2	11.6	9.9	18.5	6.5	3.3	7.0	1.1
36, Electronic and Other Electric Equipment	7,293	48.5	9.7	7.3	16.3	5.7	2.7	9.9	1.0
37, Transportation Equipment	3,425	39.9	10.4	7.8	20.7	7.7	4.0	9.5	1.1
38, Instruments and Related Products	2,916	48.9	11.7	7.3	17.3	5.7	2.0	7.0	1.1
Employment size:									
20 to 99	27,369	29.8	10.4	10.5	26.7	9.2	4.2	9.3	0.8
100 to 499	9,903	54.4	11.7	7.1	12.0	4.9	2.8	7.0	0.7
500 and over	2,284	82.6	5.5	2.3	3.0	1.0	0.8	4.9	0.5
Age of plant (years):									
Less than 5	4,731	44.4	12.0	9.3	22.5	7.5	3.7	0.7	1.8
5 to 15	12,295	42.6	11.9	9.7	22.9	7.9	4.6	0.4	1.1
16 to 30	10,690	41.3	11.0	11.7	23.0	8.7	3.4	0.8	1.1
Over 30	8,464	43.1	10.4	8.7	23.6	9.1	3.7	1.5	1.2
Not specified	3,377	1.4	0.6	0.5	6.7	0.3	0.7	89.8	0.4
Manufacturing process:									
Fabrication/ machining	6,870	31.1	10.1	10.7	31.4	10.9	5.0	0.8	1.6
Assembly	5,688	49.9	9.1	7.1	24.1	6.4	2.5	0.9	1.3
Both	21,016	47.2	13.0	11.5	15.6	8.1	4.0	0.7	0.8
Neither	2,619	18.5	6.3	2.5	59.4	7.6	3.2	2.5	1.6
Not specified	3,363	1.9	0.3	0.7	5.8	0.3	0.9	90.0	0.5
Market for most products:									
Consumer	4,451	27.6	10.5	8.4	34.5	12.6	5.5	0.8	1.2
Commercial	5,342	49.1	11.6	12.0	17.5	6.8	2.5	0.6	1.5
Industrial	17,861	42.8	12.2	10.7	21.5	8.2	3.8	0.9	1.0
Transportation	3,243	45.7	12.3	7.4	23.1	7.7	3.3	0.5	1.8
Government	2,626	57.0	10.4	7.5	15.7	5.3	3.4	0.7	2.3
Other	2,137	36.6	6.9	11.3	27.9	10.5	4.7	2.2	2.4
Not specified	3,896	4.7	0.8	1.0	12.5	0.9	2.2	78.0	0.7
Market price for most products:									
Less than $5	5,101	28.6	10.4	10.2	34.7	11.3	4.4	0.4	1.4
$5 to $100	9,209	33.3	11.3	9.6	29.3	10.2	5.5	0.8	1.2
$101 to $1,000	7,843	41.0	11.2	11.3	24.9	7.3	3.6	0.7	1.4
$1,001 to $2,000	2,002	50.2	10.8	9.5	18.5	7.6	3.4	-	2.8
$2,001 to $10,000	4,436	50.9	12.4	10.1	15.5	8.2	1.9	0.9	1.9
Over $10,000	6,328	61.8	13.0	9.2	6.9	5.5	2.6	0.9	1.5
Not specified	4,639	11.1	1.6	2.6	14.0	1.5	2.4	66.8	1.3
Products made to military specifications:									
Yes	14,588	48.4	12.2	9.2	20.1	6.4	2.9	0.7	1.0
No	19,439	38.9	11.0	10.5	25.0	9.1	4.5	0.9	0.8
Don't know	2,141	33.8	8.6	10.4	28.8	13.6	3.9	0.8	2.5
Not specified	3,388	2.5	0.6	0.6	4.8	0.6	1.4	89.6	0.5
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	50.0	12.6	10.4	16.3	6.9	3.0	0.8	1.2
26 to 75 percent	1,012	63.7	12.0	8.2	10.9	4.4	-	0.7	2.8
Over 75 percent	683	53.3	10.7	9.2	16.7	5.0	3.0	2.1	4.3
Don't know	601	51.9	8.8	6.8	22.3	5.8	4.3	-	4.8
No	22,874	37.4	11.0	10.0	27.1	9.3	4.5	0.8	0.5
Don't know	1,028	46.5	8.8	11.4	19.7	8.2	4.6	0.7	3.4
Not specified	3,349	2.2	0.3	0.6	4.8	0.5	0.8	90.9	0.4
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	48.1	12.9	10.4	18.8	6.6	2.5	0.7	1.1
26 to 75 percent	2,738	52.9	12.9	7.2	18.7	6.1	1.2	1.0	2.4
Over 75 percent	880	47.2	7.4	13.0	21.7	8.6	1.0	1.0	4.4
Don't know	1,830	44.1	11.2	8.8	22.2	6.3	6.4	1.0	2.8
No	12,901	35.9	10.7	9.6	27.9	10.0	4.9	0.9	1.0
Don't know	6,070	39.4	10.0	11.0	24.6	9.5	5.1	0.4	1.5
Not specified	3,605	5.5	0.4	1.6	5.2	1.1	1.1	85.1	1.0

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 5B. Percentage of Establishments Using, Planning, or Not Planning to Use: Computer Aided Design (CAD) Output Used to Control Manufacturing Machines

Establishment characteristic	Number of establish ments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
		Used in operations	Plan to use within:		Do not plan to use because:			Not specified	
			2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
All establishments	39,556	16.9	9.0	12.1	34.0	13.6	5.4	9.0	0.5
Major Group:									
34, Fabricated Metal Products	12,746	13.1	6.4	11.1	38.9	14.6	6.3	9.6	0.8
35, Industrial Machinery and Equipment	13,176	21.6	11.3	14.0	27.2	13.1	5.1	7.7	1.0
36, Electronic and Other Electric Equipment	7,293	16.0	9.3	11.0	36.0	12.6	4.6	10.5	0.8
37, Transportation Equipment	3,425	16.6	8.7	11.7	35.2	12.1	5.8	9.9	0.8
38, Instruments and Related Products	2,916	14.6	9.8	11.4	36.8	15.3	4.6	7.6	0.7
Employment size:									
20 to 99	27,369	14.0	7.4	10.5	38.1	14.7	5.5	9.8	0.6
100 to 499	9,903	19.5	11.8	15.9	27.1	12.2	5.8	7.7	0.6
500 and over	2,284	39.9	15.6	15.5	14.2	6.1	3.2	5.5	0.6
Age of plant (years):									
Less than 5	4,731	17.0	11.2	11.2	41.5	12.7	5.0	1.4	1.5
5 to 15	12,295	18.1	9.4	14.1	37.0	14.0	6.0	1.4	0.9
16 to 30	10,690	19.5	9.2	12.8	35.7	15.4	6.1	1.3	1.0
Over 30	8,464	18.3	10.3	13.7	34.1	16.4	5.9	1.3	0.9
Not specified	3,377	0.5	0.6	0.1	6.7	0.2	0.6	91.3	0.3
Manufacturing process:									
Fabrication/ machining	6,870	21.5	9.3	9.7	37.7	13.6	6.8	1.4	1.5
Assembly	5,688	10.6	6.8	8.2	54.5	14.2	4.1	1.6	0.7
Both	21,016	20.8	11.6	16.8	27.2	16.2	6.2	1.1	0.7
Neither	2,619	7.8	3.4	4.9	69.4	7.6	4.1	2.9	1.3
Not specified	3,363	0.8	0.3	0.2	6.1	0.5	1.0	91.2	0.4
Market for most products:									
Consumer	4,451	9.7	6.3	10.7	46.7	19.0	6.4	1.3	0.9
Commercial	5,342	19.3	11.9	12.6	37.2	12.4	5.2	1.4	1.1
Industrial	17,861	18.7	10.1	14.7	34.1	15.6	5.6	1.2	0.8
Transportation	3,243	19.7	13.0	13.8	34.6	11.7	6.0	1.2	1.5
Government	2,626	30.1	9.2	13.2	29.6	12.2	3.9	1.7	2.1
Other	2,137	16.7	5.3	9.4	41.8	14.8	9.8	2.2	2.2
Not specified	3,896	2.6	1.6	0.9	12.6	1.4	1.8	79.1	0.7
Market price for most products:									
Less than $5	5,101	11.0	8.1	11.6	44.5	18.9	5.5	0.5	1.0
$5 to $100	9,209	17.3	10.1	12.5	38.7	13.3	7.0	1.1	1.1
$101 to $1,000	7,843	19.3	10.3	13.6	36.5	14.1	4.9	1.4	1.2
$1,001 to $2,000	2,002	16.7	11.5	13.9	32.2	17.8	7.7	0.3	2.0
$2,001 to $10,000	4,436	18.9	10.4	15.7	33.5	14.7	6.1	0.7	1.4
Over $10,000	6,328	23.4	10.2	13.9	30.6	15.3	5.2	1.5	1.2
Not specified	4,639	7.7	1.7	2.9	14.6	2.2	1.8	69.0	1.2
Products made to military specifications:									
Yes	14,588	25.0	12.4	14.0	29.3	12.9	5.0	1.3	0.9
No	19,439	13.7	7.8	12.7	42.1	15.7	6.6	1.4	0.6
Don't know	2,141	16.4	10.4	12.2	37.0	19.0	4.2	0.8	2.0
Not specified	3,388	0.7	0.6	0.5	5.6	0.8	0.9	90.9	0.3
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	21.4	11.7	15.3	30.1	14.3	5.5	1.7	1.0
26 to 75 percent	1,012	27.7	10.5	17.7	26.1	12.5	3.5	1.8	3.0
Over 75 percent	683	31.9	9.1	11.6	34.0	9.3	1.6	2.6	4.0
Don't know	601	18.8	8.5	10.4	36.8	18.1	6.7	0.6	3.0
No	22,874	16.3	9.1	12.2	40.2	15.0	6.0	1.1	0.6
Don't know	1,028	15.5	9.4	15.2	33.2	16.5	9.5	0.7	2.0
Not specified	3,349	1.0	0.1	0.2	4.7	1.0	0.8	92.3	0.3
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	22.5	12.0	14.7	31.1	14.2	4.3	1.2	1.0
26 to 75 percent	2,738	30.6	12.3	14.6	27.7	9.8	3.2	1.6	2.2
Over 75 percent	880	34.8	9.6	11.3	27.8	14.5	2.0	0.1	4.4
Don't know	1,830	18.8	9.3	9.7	35.2	14.7	10.4	1.9	2.2
No	12,901	12.8	7.8	12.3	43.2	15.7	6.7	1.5	0.7
Don't know	6,070	14.3	9.7	12.6	39.7	16.2	7.0	0.5	1.1
Not specified	3,605	2.1	0.2	2.0	6.4	1.4	1.6	86.2	0.6

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 5C. Percentage of Establishments Using, Planning, or Not Planning to Use: Digital Representation of Computer Aided Design Output Used in Procurement Activities

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	9.9	6.7	10.8	40.9	14.1	8.1	9.5	0.3
Major Group:									
34, Fabricated Metal Products	12,746	6.5	4.7	10.0	45.5	14.6	8.7	10.0	0.5
35, Industrial Machinery and Equipment	13,176	11.0	7.9	11.9	39.0	14.0	7.8	8.3	0.7
36, Electronic and Other Electric Equipment	7,293	12.8	7.6	9.8	38.1	13.6	7.4	10.6	0.7
37, Transportation Euipment	3,425	10.0	6.7	11.9	38.6	13.1	9.0	10.9	0.6
38, Instruments and Related Products	2,916	12.5	8.2	10.7	38.9	14.2	7.7	7.8	0.7
Employment size:									
20 to 99	27,369	7.5	5.5	9.1	45.6	15.0	7.1	10.2	0.5
100 to 499	9,903	12.2	9.1	14.2	32.5	13.2	10.6	8.2	0.5
500 and over	2,284	29.2	11.5	17.3	20.2	7.1	9.0	5.7	0.6
Age of plant (years):									
Under 5	4,731	11.9	8.8	10.6	47.1	12.4	7.8	1.3	1.1
5 to 15	12,295	11.4	7.5	11.8	43.9	15.3	8.6	1.6	0.7
16 to 30	10,690	9.5	7.3	12.5	44.2	15.4	9.0	2.1	0.6
Over 30	8,464	11.0	6.3	11.6	42.6	16.9	9.5	2.0	0.7
Not specified	3,377	0.3	0.6	0.4	6.1	0.6	0.6	91.4	0.2
Manufacturing process:									
Fabricated machining	6,870	9.3	4.7	9.7	50.8	15.0	8.5	2.0	1.0
Assembly	5,688	13.3	7.0	9.2	48.5	13.9	6.5	1.5	0.7
Both	21,016	11.1	8.7	14.2	37.5	16.8	10.1	1.7	0.5
Neither	2,619	7.0	4.0	3.8	70.1	7.5	4.1	3.5	1.2
Not specified	3,363	0.4	0.5	0.4	6.1	0.6	0.7	91.3	0.3
Market for most products:									
Consumer	4,451	8.8	4.9	9.3	50.5	16.7	8.5	1.2	0.8
Commercial	5,342	13.2	8.6	14.8	40.9	13.2	7.6	1.8	0.8
Industrial	17,861	9.7	7.6	11.6	44.5	16.2	8.6	1.9	0.6
Transportation	3,243	10.5	8.8	13.0	42.3	13.8	9.9	1.9	0.9
Government	2,626	17.8	9.4	13.7	34.3	14.6	8.3	1.9	1.8
Other	2,137	10.9	4.4	8.7	46.6	14.4	12.3	2.6	1.6
Not specified	3,896	1.7	0.4	1.0	13.5	2.2	2.1	79.2	0.4
Market price for most products:									
Less than $5	5,101	6.1	6.9	8.5	51.4	18.6	7.4	1.1	0.7
$5 to $100	9,209	8.8	6.8	9.6	48.7	14.3	10.0	1.7	0.7
$101 to $1,000	7,843	9.6	6.1	12.4	47.4	14.4	8.6	1.5	0.8
$1,001 to $2,000	2,002	13.1	7.6	12.3	38.8	16.7	10.9	0.5	2.0
$2,001 to $10,000	4,436	12.5	7.9	15.3	37.5	16.6	8.6	1.6	1.1
Over $10,000	6,328	15.8	10.3	14.9	33.4	15.5	8.4	1.7	1.0
Not specified	4,639	5.1	1.3	2.7	17.1	2.5	2.1	69.3	1.0
Products made to military specifications:									
Yes	14,588	13.5	8.9	13.1	40.0	13.8	8.9	1.8	0.7
No	19,439	9.1	6.4	10.9	46.8	16.1	8.9	1.9	0.5
Don t know	2,141	8.2	6.1	10.3	49.0	18.6	6.7	1.1	1.3
Not specified	3,388	0.5	0.3	0.6	5.9	0.8	0.9	91.1	0.2
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	12.7	8.1	13.6	38.9	15.2	9.5	1.9	0.7
26 to 75 percent	1,012	19.2	8.6	16.2	30.5	13.9	9.4	2.2	2.9
Over 75 percent	683	15.2	8.7	17.4	37.4	11.2	8.0	2.1	2.8
Dont know	601	14.1	11.0	11.2	40.5	14.0	8.3	1.0	2.6
No	22,874	9.4	7.0	10.6	47.5	15.6	8.2	1.7	0.5
Don't know	1,028	10.0	4.5	12.0	42.3	15.9	14.3	1.0	1.7
Not specified	3,349	0.7	(Z)	0.6	4.6	0.8	0.9	92.5	0.3
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	12.8	8.1	13.8	40.4	15.1	8.0	1.9	0.7
26 to 75 percent	2,738	15.7	8.0	13.5	39.0	14.3	8.0	1.7	1.7
Over 75 percent	880	16.4	11.0	9.4	39.6	18.6	4.3	0.7	3.5
Don't know	1,830	10.9	7.1	8.7	43.8	16.3	10.8	2.4	1.3
No	12,901	8.6	6.5	10.9	48.4	14.8	8.9	1.9	0.6
Don't know	6,070	7.7	7.4	10.3	46.7	16.8	10.5	0.7	0.6
Not specified	3,605	2.8	0.2	1.5	5.9	1.4	1.4	86.9	0.8

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 6A. Percentage of Establishments Using, Planning, or Not Planning to Use: Flexible Manufacturing Cells or Systems

Establishment characteristic	Number of establishments[1]	Percent distribution							Abso stanc erro “Use operatio (perce
		Used in operations	Plan to use within:		Do not plan to use because:			Not specified	
			2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
All establishments	39,556	10.7	4.3	7.2	46.0	15.0	7.3	9.5	
Major Group:									
34, Fabricated Metal Products	12,746	9.0	3.1	7.6	48.1	14.7	7.8	9.8	
35, Industrial Machinery and Equipment	13,176	11.0	4.0	7.5	45.3	15.9	7.4	8.9	
36, Electronic and Other Electric Equipment	7,293	11.9	5.7	6.1	45.9	13.4	6.6	10.4	
37, Transportation Equipment	3,425	12.6	5.4	7.0	42.5	13.9	7.5	11.1	
38, Instruments and Related Products	2,916	10.8	5.4	7.8	44.5	17.1	7.0	7.4	
Employment size:									
20 to 99	27,369	6.5	2.4	5.7	51.8	15.8	7.3	10.5	
100 to 499	9,903	16.2	7.5	10.1	36.1	14.4	8.2	7.6	
500 and over	2,284	35.9	12.7	12.4	20.3	8.2	4.5	5.9	
Age of plant (years):									
Under 5	4,731	10.7	4.6	7.9	51.6	15.3	8.6	1.2	
5 to 15	12,295	11.7	4.6	7.9	51.1	15.0	8.0	1.7	
16 to 30	10,690	11.2	4.1	7.6	49.2	18.3	7.6	2.0	
Over 30	8,464	12.6	5.4	8.3	46.7	16.5	8.0	2.5	
Not specified	3,377	-	-	0.1	7.9	0.2	0.7	91.0	
Manufacturing process:									
Fabricated machining	6,870	9.6	3.1	8.1	54.1	15.3	7.8	1.9	
Assembly	5,688	11.8	4.6	5.5	58.7	13.2	4.8	1.3	
Both	21,016	13.2	5.5	8.9	42.2	18.8	9.2	2.1	
Neither	2,619	3.8	1.8	4.0	78.0	6.2	4.2	2.0	
Not specified	3,363	0.3	-	0.1	7.0	0.4	1.1	91.1	
Market for most products:									
Consumer	4,451	11.8	4.3	8.2	52.2	14.4	7.2	1.9	
Commercial	5,342	13.8	5.7	9.4	46.6	16.2	7.1	1.3	
Industrial	17,861	9.9	4.0	7.5	51.4	17.7	7.7	1.9	
Transportation	3,243	18.0	7.3	8.7	41.3	15.4	6.8	2.4	
Government	2,626	12.7	5.0	9.0	47.5	15.8	7.8	2.1	
Other	2,137	10.7	3.5	5.8	49.8	12.1	15.3	2.9	
Not specified	3,896	0.9	0.8	0.3	14.2	2.3	2.2	79.2	
Market price of most products:									
Less than $5	5,101	12.2	5.0	6.4	53.2	14.9	7.0	1.3	
$5 to $100	9,209	13.2	5.1	8.1	46.9	15.8	9.0	1.8	
$101 to $1,000	7,843	10.3	4.6	9.7	50.4	16.6	6.6	1.7	
$1,001 to $2,000	2,002	9.2	5.3	8.8	47.8	20.6	7.2	1.1	
$2,001 to $10,000	4,436	9.8	3.9	7.7	49.6	17.7	9.6	1.7	
Over $10,000	6,328	12.0	4.4	6.2	49.7	17.7	8.0	2.1	
Not specified	4,639	4.1	0.8	2.5	19.6	1.9	2.8	68.3	
Products made to military specifications:									
Yes	14,588	15.0	5.6	8.8	45.6	15.3	7.6	2.1	
No	19,439	9.2	3.9	7.4	52.9	16.5	8.2	1.9	
Don't know	2,141	10.1	4.6	6.2	48.8	21.4	8.1	0.8	
Not specified	3,388	0.5	0.2	0.3	6.5	1.0	1.0	90.5	
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	12.7	5.5	9.1	44.8	17.1	8.8	2.0	
26 to 75 percent	1,012	13.3	6.5	10.8	41.3	20.1	6.1	1.9	
Over 75 percent	683	15.5	4.4	7.0	48.1	13.6	7.4	4.0	
Don't know	601	13.6	2.8	7.3	48.3	18.2	9.4	0.4	
No	22,874	10.7	4.2	7.2	52.9	15.6	7.5	1.9	
Don't know	1,028	15.7	5.0	9.4	38.0	21.1	10.2	0.7	
Not specified	3,349	0.7	-	0.1	5.7	0.7	0.9	91.8	
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense:									
1 to 25 percent	11,533	13.2	5.0	8.1	46.2	17.0	7.6	2.8	
26 to 75 percent	2,738	13.2	5.4	8.6	48.4	18.1	4.9	1.4	
Over 75 percent	880	12.0	4.7	11.7	53.2	15.0	2.9	0.5	
Don't know	1,830	11.4	4.4	9.8	46.2	16.4	10.5	1.3	
No	12,901	9.7	3.8	6.6	54.8	14.5	8.8	1.8	
Don't know	6,070	11.4	5.5	8.5	47.1	18.5	8.2	0.9	
Not specified	3,605	2.1	0.2	1.1	8.5	1.1	1.2	85.9	

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estima Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 6B. Percentage of Establishments Using, Planning, or Not Planning to Use: Numerically Controlled or Computer Numerically Controlled Machines

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	41.4	2.9	5.0	29.8	8.7	3.6	8.7	0.6
Major Group:									
34, Fabricated Metal Products	12,746	32.2	3.2	5.6	34.2	10.4	5.0	9.4	1.1
35, Industrial Machinery and Equipment	13,176	56.7	2.4	5.6	19.2	6.4	2.3	7.4	1.1
36, Electronic and Other Electric Equipment	7,293	34.9	2.9	3.9	36.4	8.5	3.4	10.0	1.0
37, Transportation Equipment	3,425	37.3	3.5	3.1	32.3	9.5	4.3	10.0	1.0
38, Instruments and Related Products	2,916	33.6	2.6	4.1	38.6	11.0	3.2	6.9	1.1
Employment size:									
20 to 99	27,369	35.9	2.7	5.4	33.0	9.8	3.7	9.5	0.8
100 to 499	9,903	50.0	3.6	4.4	24.0	7.0	3.8	7.1	0.7
500 and over	2,284	69.8	2.1	2.3	15.7	3.0	1.9	5.2	0.6
Age of plant (years):									
Under 5	4,731	37.3	3.4	5.9	39.1	9.4	4.0	1.0	1.8
5 to 15	12,295	42.3	3.0	5.4	35.3	8.5	4.4	1.1	1.1
16 to 30	10,690	48.0	3.9	5.1	28.3	10.0	3.7	0.9	1.2
Over 30	8,464	50.0	2.2	5.7	27.7	10.2	3.4	0.7	1.2
Not specified	3,377	1.0	(Z)	0.2	6.4	0.2	0.8	91.3	0.6
Manufacturing process:									
Fabricated machining	6,870	53.5	3.1	5.5	23.1	9.8	4.0	1.1	1.7
Assembly	5,688	15.1	2.6	2.7	63.4	10.7	4.1	1.3	0.8
Both	21,016	55.0	3.4	6.4	21.0	9.6	3.8	0.7	0.8
Neither	2,619	9.6	2.2	2.9	74.7	4.6	3.3	2.6	1.2
Not specified	3,363	0.9	-	(Z)	6.4	0.3	1.1	91.2	0.4
Market for most products:									
Consumer	4,451	23.9	4.4	6.8	46.4	12.6	4.8	1.2	1.3
Commercial	5,342	41.7	2.1	4.7	37.2	9.0	4.5	0.9	1.5
Industrial	17,861	49.5	3.1	5.7	27.9	9.6	3.4	0.8	1.0
Transportation	3,243	47.9	4.9	5.8	26.3	9.9	3.4	1.7	1.8
Government	2,626	62.0	1.8	3.7	24.7	4.7	2.3	0.8	2.1
Other	2,137	36.9	3.2	4.0	38.0	9.3	7.2	1.4	2.6
Not specified	3,896	6.7	0.1	0.7	11.1	0.9	1.3	79.1	1.1
Market price of most products:									
Less than $5	5,101	29.0	4.0	7.6	41.2	13.9	4.0	0.2	1.4
$5 to $100	9,209	45.1	3.3	5.7	32.0	8.0	4.8	1.0	1.3
$101 to $1,000	7,843	51.5	3.0	4.5	29.2	8.0	2.9	0.9	1.5
$1,001 to $2,000	2,002	49.2	2.3	5.0	28.2	9.2	4.2	1.7	2.8
$2,001 to $10,000	4,436	45.0	2.4	5.5	31.0	10.8	4.6	0.6	1.9
Over $10,000	6,328	48.8	3.2	4.4	29.5	9.3	3.6	1.2	1.4
Not specified	4,639	13.4	0.7	1.6	13.5	2.5	1.0	67.2	1.5
Products made to military specifications:									
Yes	14,588	58.1	3.3	5.1	23.8	6.8	2.3	0.5	1.0
No	19,439	36.1	3.0	5.5	38.3	10.9	4.9	1.3	0.8
Don't know	2,141	38.4	2.6	6.2	32.0	14.8	5.3	0.8	2.7
Not specified	3,388	1.5	0.1	0.8	5.2	0.4	1.1	90.9	0.4
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	51.7	3.0	4.8	27.6	8.6	3.5	0.7	1.2
26 to 75 percent	1,012	62.5	3.1	3.8	20.7	8.1	1.2	0.7	2.9
Over 75 percent	683	61.2	1.9	4.7	23.1	5.9	1.0	2.1	4.0
Don't know	601	37.3	1.6	4.4	41.5	10.1	4.5	0.6	4.2
No	22,874	41.2	3.3	5.6	34.7	9.9	4.2	1.1	0.8
Don't know	1,028	42.0	1.9	8.2	30.4	11.2	5.5	0.8	3.3
Not specified	3,349	2.0	0.1	0.5	4.5	0.2	1.0	91.8	0.5
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	53.7	3.2	6.1	25.7	7.8	2.8	0.6	1.1
26 to 75 percent	2,738	67.1	3.4	2.3	21.2	4.5	1.4	0.2	2.0
Over 75 percent	880	67.4	2.0	1.8	23.8	4.2	0.3	0.5	4.0
Don't know	1,830	44.3	2.3	4.6	30.4	11.4	5.7	1.4	2.8
No	12,901	32.9	3.2	5.6	40.7	11.1	5.2	1.3	1.0
Don't know	6,070	42.0	3.3	5.6	32.8	11.3	4.2	0.9	1.6
Not specified	3,605	4.1	0.2	0.9	6.1	1.5	1.2	86.0	0.7

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 6C. **Percentage of Establishments Using, Planning, or Not Planning to Use: Materials Working Lasers**

Establishment characteristic	Number of establish ments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	4.3	2.3	6.8	53.6	16.7	7.2	9.1	0.2
Major Group:									
34, Fabricated Metal Products	12,746	2.9	1.9	7.0	53.2	17.7	7.5	9.8	0.4
35, Industrial Machinery and Equipment	13,176	3.6	2.3	7.8	53.6	17.4	7.6	7.8	0.4
36, Electronic and Other Electric Equipment	7,293	7.5	2.3	5.0	54.9	13.9	6.1	10.3	0.5
37, Transportation Equipment	3,425	6.0	3.6	7.7	48.5	16.7	7.2	10.4	0.5
38, Instruments and related Products	2,916	4.3	3.2	4.7	57.6	16.3	6.5	7.3	0.4
Employment size:									
20 to 99	27,369	2.4	1.5	5.9	56.8	16.8	6.6	9.9	0.3
100 to 499	9,903	5.8	3.3	8.5	48.5	17.6	8.8	7.5	0.4
500 and over	2,284	21.6	7.9	10.3	35.9	11.6	6.9	5.8	0.6
Age of plant (years):									
Under 5	4,731	3.9	2.2	7.6	60.9	15.7	8.3	1.3	0.7
5 to 15	12,295	4.6	2.8	7.3	59.9	17.5	6.9	1.2	0.5
16 to 30	10,690	3.9	2.3	7.8	56.9	19.5	8.2	1.5	0.3
Over 30	8,464	6.6	2.7	7.0	54.4	19.2	8.3	1.7	0.5
Not specified	3,377	-	-	0.1	7.5	0.3	0.7	91.4	-
Manufacturing process:									
Fabricated machining	6,870	3.4	2.6	6.1	59.5	18.4	8.1	1.9	0.5
Assembly	5,688	4.2	1.9	3.0	72.0	12.7	4.9	1.3	0.4
Both	21,016	5.5	2.8	9.6	50.7	21.3	8.8	1.2	0.3
Neither	2,619	2.9	1.5	2.9	80.4	5.5	4.1	2.7	0.6
Not specified	3,363	0.3	-	0.1	7.0	0.4	1.1	91.3	0.3
Market for most products:									
Consumer	4,451	3.6	1.9	6.7	61.1	18.7	6.7	1.2	0.5
Commercial	5,342	5.2	3.2	6.7	56.0	21.5	6.2	1.2	0.7
Industrial	17,861	4.2	2.1	7.6	58.5	18.6	7.8	1.4	0.4
Transportation	3,243	5.1	4.3	8.8	55.6	17.0	7.2	2.0	0.7
Government	2,626	10.4	4.0	11.2	53.4	12.9	6.7	1.5	1.1
Other	2,137	3.5	2.0	4.2	58.4	15.4	14.7	1.8	0.6
Not specified	3,896	0.5	0.4	0.2	14.7	2.7	2.3	79.2	0.3
Market price of most products:									
Less than $5	5,101	4.3	1.2	5.1	64.1	18.0	6.6	0.6	0.6
$5 to $100	9,209	4.6	2.7	6.8	57.2	18.2	8.9	1.6	0.5
$101 to $1,000	7,843	5.2	3.2	8.4	57.2	17.7	7.2	1.2	0.6
$1,001 to $2,000	2,002	3.2	1.6	10.1	55.2	22.5	7.0	0.4	1.1
$2,001 to $10,000	4,436	3.2	2.2	6.9	58.3	20.1	8.0	1.4	0.4
Over $10,000	6,328	5.8	3.3	9.2	53.8	18.4	8.0	1.6	0.5
Not specified	4,639	2.0	0.5	1.1	23.2	2.7	2.5	67.9	0.5
Products made to military specifications:									
Yes	14,588	6.7	3.4	8.7	54.1	18.5	7.2	1.4	0.4
No	19,439	3.1	1.9	6.8	60.6	18.0	8.1	1.5	0.3
Don't know	2,141	5.7	1.8	4.5	58.8	19.2	9.0	0.9	1.5
Not specified	3,388	0.1	0.4	0.2	7.1	0.2	1.0	90.9	0.1
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	5.7	2.6	7.8	55.7	19.1	8.0	1.1	0.4
26 to 75 percent	1,012	7.2	5.6	10.4	52.8	17.7	5.3	1.1	0.9
Over 75 percent	683	10.8	4.5	14.3	44.2	14.9	6.5	4.8	1.4
Don't know	601	9.4	4.4	3.5	55.8	13.8	11.9	1.3	3.0
No	22,874	3.8	2.3	6.9	59.9	18.3	7.5	1.4	0.3
Don't know	1,028	5.6	2.9	8.6	53.4	15.8	12.3	1.3	1.3
Not specified	3,349	0.3	0.1	0.3	6.0	0.1	0.9	92.3	0.2
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	5.7	3.3	7.7	54.9	19.5	7.3	1.6	0.4
26 to 75 percent	2,738	7.4	3.5	9.8	56.9	17.7	4.3	0.5	1.0
Over 75 percent	880	8.5	2.8	12.5	59.4	13.8	2.6	0.5	1.7
Don't know	1,830	6.3	1.8	8.5	55.5	15.4	11.2	1.4	1.2
No	12,901	3.1	2.0	6.3	61.0	17.4	8.5	1.6	0.4
Don't know	6,070	4.0	2.1	7.1	57.9	19.8	8.3	0.9	0.5
Not specified	3,605	0.7	0.1	0.9	10.2	0.6	1.3	86.2	0.2

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 6D. Percentage of Establishments Using, Planning, or Not Planning to Use: Pick and Place Robots

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	7.7	4.2	8.0	44.4	20.6	6.2	8.9	0.2
Major Group:									
34, Fabricated Metal Products	12,746	5.7	3.7	8.6	45.0	20.6	6.8	9.4	0.4
35, Industrial Machinery and Equipment	13,176	5.8	3.4	6.8	48.3	21.4	6.3	7.9	0.4
36, Electronic and Other Electric Equipment	7,293	13.1	6.3	9.3	37.7	18.6	4.9	10.1	0.6
37, Transportation Equipment	3,425	10.4	3.6	7.8	41.8	19.7	6.5	10.2	0.6
38, Instruments and Related Products	2,916	8.6	5.2	8.0	43.4	22.7	5.1	6.9	0.5
Employment size:									
20 to 99	27,369	2.7	2.8	6.7	51.0	20.9	6.1	9.8	0.3
100 to 499	9,903	13.4	6.9	10.9	32.9	21.9	6.7	7.3	0.5
500 and over	2,284	43.3	8.9	11.9	14.9	11.6	4.0	5.3	0.7
Age of plant (years):									
Under 5	4,731	4.6	5.6	8.0	51.1	22.2	7.4	1.0	0.7
5 to 15	12,295	7.7	5.2	8.6	49.2	22.2	6.2	1.0	0.5
16 to 30	10,690	8.6	4.0	9.1	46.7	23.1	7.0	1.3	0.5
Over 30	8,464	11.5	3.9	8.9	45.5	22.1	6.4	1.7	0.5
Not specified	3,377	0.1	-	0.3	7.0	0.5	0.7	91.4	0.1
Manufacturing process:									
Fabricated machining	6,870	4.1	4.0	6.4	55.2	21.4	7.6	1.4	0.4
Assembly	5,688	11.2	5.9	8.7	48.6	20.3	4.2	1.1	0.7
Both	21,016	9.6	4.6	10.0	42.6	24.8	7.3	1.1	0.4
Neither	2,619	4.6	3.6	4.4	69.7	11.2	4.2	2.5	0.9
Not specified	3,363	0.2	-	0.7	6.4	0.3	1.1	91.2	0.1
Market for most products:									
Consumer	4,451	12.5	5.6	8.7	44.8	22.0	5.0	1.3	0.8
Commercial	5,342	8.7	4.5	10.1	43.5	25.8	5.9	1.6	0.6
Industrial	17,861	6.2	4.1	8.2	51.2	22.4	6.8	1.1	0.3
Transportation	3,243	16.1	6.6	10.2	38.0	21.0	6.6	1.5	1.2
Government	2,626	10.1	6.2	9.1	46.6	21.8	5.2	1.0	0.9
Other	2,137	4.5	2.0	7.2	52.7	20.0	11.7	1.9	0.5
Not specified	3,896	1.1	0.5	1.4	13.0	2.8	2.0	79.2	0.3
Market price for most products:									
Less than $5	5,101	13.3	7.1	10.9	40.0	21.6	6.4	0.7	0.9
$5 to $100	9,209	12.2	6.0	10.2	42.2	21.4	6.9	1.2	0.6
$101 to $1,000	7,843	6.4	4.4	9.8	48.6	23.1	6.7	1.1	0.5
$1,001 to $2,000	2,002	3.6	4.8	10.8	45.2	27.3	8.0	0.2	0.6
$2,001 to $10,000	4,436	4.5	2.9	6.3	51.8	26.9	6.9	0.8	0.4
Over $10,000	6,328	6.8	2.4	5.5	55.7	21.8	6.3	1.5	0.6
Not specified	4,639	1.2	0.5	1.5	23.6	3.0	1.8	68.4	0.3
Products made to military specifications:									
Yes	14,588	9.3	5.3	10.6	45.0	22.2	6.2	1.4	0.4
No	19,439	7.8	4.1	7.4	50.3	22.4	6.7	1.2	0.3
Don't know	2,141	7.8	4.2	7.8	46.8	23.9	8.7	0.8	1.2
Not specified	3,388	0.5	(Z)	0.3	5.9	1.2	1.2	90.9	0.1
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	8.3	5.2	10.9	44.4	23.5	6.9	1.0	0.4
26 to 75 percent	1,012	8.1	6.6	9.7	45.0	24.7	3.2	2.7	0.9
Over 75 percent	683	14.9	7.2	6.1	42.4	21.4	5.3	2.7	1.6
Don't know	601	13.3	3.1	8.4	46.7	19.2	8.6	0.6	2.1
No	22,874	7.8	4.2	8.0	50.3	22.0	6.5	1.2	0.3
Don't know	1,028	14.9	5.1	6.5	39.3	23.2	10.5	0.7	2.0
Not specified	3,349	0.6	-	0.3	5.4	0.6	0.9	92.2	0.2
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	9.0	5.1	10.3	44.4	23.4	6.5	1.4	0.4
26 to 75 percent	2,738	9.7	4.7	10.2	50.9	19.4	3.4	1.7	1.2
Over 75 percent	880	4.4	6.7	11.7	52.2	22.5	2.3	0.3	0.9
Don't Know	1,830	9.5	4.4	10.4	43.5	21.0	10.0	1.2	1.2
No	12,901	6.9	3.9	6.4	53.2	21.3	7.1	1.2	0.4
Don't know	6,070	10.0	4.9	9.3	42.9	25.2	7.0	0.7	0.7
Not specified	3,605	1.2	0.1	0.7	8.7	1.9	1.5	85.9	0.3

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 6E. Percentage of Establishments Using, Planning, or Not Planning to Use: Other Robots

Establishment characteristic	Number of establish ments[1]	Percent distribution							Absolu standa error "Used operations (percent
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	5.7	3.3	7.9	45.4	21.0	7.6	9.2	0
Major Group:									
34, Fabricated Metal Products	12,746	4.4	2.8	8.5	45.2	20.6	8.5	9.9	0
35, Industrial Machinery and Equipment	13,176	5.2	2.8	6.8	48.5	21.4	7.4	7.9	0
36, Electronic and Other Electric Equipment	7,293	6.9	4.7	9.5	41.8	20.0	6.6	10.5	0
37, Transportation Equipment	3,425	10.5	4.1	6.6	41.7	19.8	7.0	10.3	0
38, Instruments and Related Products	2,916	4.4	3.0	7.5	45.9	24.5	7.1	7.6	0
Employment size:									
20 to 99	27,369	2.4	2.0	6.0	51.4	21.0	7.2	10.0	0
100 to 499	9,903	8.1	5.6	11.8	35.2	22.8	8.8	7.7	0
500 and over	2,284	35.0	9.1	13.2	17.7	12.7	6.5	5.9	0
Age of plant (years):									
Under 5	4,731	3.7	3.7	7.5	51.9	21.9	9.6	1.6	0
5 to 15	12,295	5.1	4.3	8.3	50.4	23.1	7.6	1.2	0
16 to 30	10,690	6.3	3.3	9.1	47.8	23.5	8.4	1.6	0
Over 30	8,464	9.1	2.8	9.1	46.9	22.2	8.1	1.9	0
Not specified	3,377	0.1	-	-	7.3	0.5	0.6	91.5	0
Manufacturing process:									
Fabricated machining	6,870	3.7	2.8	6.0	55.7	21.2	8.7	1.9	0
Assembly	5,688	5.9	4.5	7.4	54.1	21.0	5.7	1.3	0
Both	21,016	7.5	3.8	9.9	43.0	25.3	9.2	1.4	0
Neither	2,619	2.5	1.8	7.6	69.0	12.1	4.2	2.8	0
Not specified	3,363	0.2	-	0.3	6.9	0.3	0.9	91.4	0
Market for most products:									
Consumer	4,451	7.3	5.1	9.9	45.7	24.4	6.3	1.3	0
Commercial	5,342	5.7	3.2	10.9	44.7	26.8	7.0	1.7	0
Industrial	17,861	4.5	3.1	7.8	52.2	22.6	8.5	1.5	0
Transportation	3,243	12.8	6.8	9.4	40.4	20.0	8.6	2.0	1
Government	2,626	8.4	3.1	8.5	49.5	22.6	6.7	1.3	1
Other	2,137	6.7	1.7	5.5	52.2	18.2	13.7	1.9	1
Not specified	3,896	0.9	0.3	1.8	13.0	2.6	2.2	79.2	0
Market price of most products:									
Less than $5	5,101	5.0	4.8	9.7	45.5	24.4	9.0	1.5	0
$5 to $100	9,209	7.5	5.0	10.3	44.8	22.9	8.1	1.4	0
$101 to $1,000	7,843	6.0	3.3	9.0	50.1	22.0	8.3	1.3	0
$1,001 to $2,000	2,002	3.6	2.9	8.9	46.2	28.1	9.3	1.1	0
$2,001 to $10,000	4,436	4.5	2.1	6.8	51.0	26.7	8.0	1.1	0
Over $10,000	6,328	7.7	2.7	6.5	52.3	21.3	7.7	1.9	0
Not specified	4,639	1.6	0.2	2.1	23.4	2.4	2.3	67.9	0
Products made to military specifications:									
Yes	14,588	7.3	4.0	9.8	46.7	22.6	8.0	1.5	0
No	19,439	5.6	3.3	7.9	50.9	22.8	8.0	1.5	0
Don't know	2,141	3.9	3.1	7.3	48.3	24.9	10.8	1.7	0
Not specified	3,388	0.3	0.3	0.2	6.4	0.7	1.0	91.1	0
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	6.7	3.9	9.4	45.8	24.1	8.9	1.2	0
26 to 75 percent	1,012	6.8	3.1	10.5	47.9	24.6	5.3	1.7	0
Over 75 percent	683	15.5	3.4	5.0	45.1	22.5	6.1	2.4	2
Don't know	601	9.2	2.2	8.0	47.5	21.0	10.1	2.0	1
No	22,874	5.5	3.5	8.3	51.2	22.1	7.8	1.6	0
Don't know	1,028	6.9	3.1	8.9	40.1	27.4	12.9	0.7	0
Not specified	3,349	0.3	-	0.2	5.6	0.4	0.8	92.6	0
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	6.4	3.9	10.4	45.3	24.0	8.3	1.6	0
26 to 75 percent	2,738	9.0	2.2	9.3	53.9	19.9	4.9	1.0	1
Over 75 percent	880	5.7	3.9	7.9	53.0	25.0	3.4	1.2	2
Don't know	1,830	7.1	3.2	8.7	47.1	20.0	12.3	1.7	1
No	12,901	5.0	3.3	6.7	53.5	21.5	8.3	1.7	0
Don't know	6,070	6.6	4.6	9.3	44.2	25.6	8.7	1.1	0
Not specified	3,605	1.0	0.1	0.5	9.7	1.5	1.1	86.1	0

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimate Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 7A. Percentage of Establishments Using, Planning, or Not Planning to Use: Automatic Storage and Retrieval Systems

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
		Used in operations	Plan to use within:		Do not plan to use because:			Not specified	
			2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
All establishments	39,556	3.2	1.6	4.2	46.0	30.0	6.4	8.7	0.2
Major Group:									
34, Fabricated Metal Products	12,746	1.0	0.8	3.4	48.1	30.5	6.8	9.4	0.2
35, Industrial Machinery and Equipment	13,176	3.6	1.6	3.4	50.5	27.5	6.1	7.3	0.4
36, Electronic and Other Electric Equipment	7,293	4.9	2.5	5.9	39.4	31.2	6.1	10.1	0.3
37, Transportation Equipment	3,425	4.7	2.0	4.5	41.5	29.5	7.4	10.3	0.4
38, Instruments and Related Products	2,916	4.2	2.1	7.0	37.7	36.4	5.5	7.0	0.3
Employment size:									
20 to 99	27,369	1.2	0.8	2.4	52.8	27.6	5.8	9.5	0.2
100 to 499	9,903	3.7	2.8	7.4	33.8	37.0	7.9	7.4	0.3
500 and over	2,284	24.4	5.6	12.2	17.0	28.5	7.1	5.2	0.6
Age of plant (years):									
Under 5	4,731	3.2	1.5	5.5	50.1	31.2	7.6	1.0	0.7
5 to 15	12,295	2.8	2.2	5.0	49.1	33.2	6.5	1.1	0.3
16 to 30	10,690	3.3	1.3	4.1	50.3	33.0	7.3	0.8	0.3
Over 30	8,464	4.7	1.7	4.1	48.9	32.5	6.7	1.3	0.3
Not specified	3,377	-	-	0.3	7.4	0.5	0.6	91.1	-
Manufacturing process:									
Fabricated machining	6,870	1.4	0.8	2.3	56.5	30.4	7.1	1.5	0.3
Assembly	5,688	5.1	2.7	6.6	44.8	34.3	5.4	1.1	0.4
Both	21,016	3.9	1.8	4.9	46.4	34.6	7.6	0.9	0.2
Neither	2,619	2.0	0.8	3.6	68.4	19.2	4.3	1.7	0.7
Not specified	3,363	-	(Z)	0.3	6.4	1.1	0.9	91.3	-
Market for most products:									
Consumer	4,451	2.7	2.0	5.4	48.2	34.6	6.2	0.9	0.4
Commercial	5,342	4.5	1.9	6.9	42.4	37.1	6.4	0.9	0.5
Industrial	17,861	2.7	1.4	3.8	53.8	30.9	6.4	1.1	0.2
Transportation	3,243	5.5	2.4	4.8	43.8	33.7	8.5	1.4	0.7
Government	2,626	5.9	2.4	4.7	44.2	36.1	5.8	1.0	0.8
Other	2,137	3.0	1.0	3.9	49.1	28.4	12.9	1.6	0.6
Not specified	3,896	0.4	0.2	0.8	13.9	4.2	1.5	79.0	0.1
Market price of most products:									
Less than $5	5,101	1.3	1.1	4.2	47.7	38.4	6.7	0.4	0.2
$5 to $100	9,209	2.4	2.4	4.9	47.3	33.8	7.9	1.3	0.3
$101 to $1,000	7,843	2.7	1.3	4.6	49.9	34.4	6.5	0.7	0.3
$1,001 to $2,000	2,002	4.5	2.1	7.6	46.5	31.9	7.2	0.2	1.1
$2,001 to $10,000	4,436	3.4	1.0	3.6	49.3	34.0	7.8	0.9	0.3
Over $10,000	6,328	6.7	2.2	4.7	52.1	27.1	5.7	1.5	0.5
Not specified	4,639	1.9	0.1	0.8	23.2	4.7	2.0	67.2	0.7
Products made to military specifications:									
Yes	14,588	4.5	1.9	4.8	47.3	34.3	6.5	0.6	0.3
No	19,439	2.7	1.6	4.5	51.7	31.0	7.1	1.4	0.2
Don't know	2,141	3.0	1.6	3.6	47.5	35.9	7.6	0.8	0.4
Not specified	3,388	0.1	0.1	0.4	5.8	2.0	0.9	90.7	0.1
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	4.4	1.6	5.2	43.7	37.2	7.2	0.7	0.4
26 to 75 percent	1,012	5.9	2.0	6.3	48.0	32.8	4.1	1.0	0.7
Over 75 percent	683	8.4	1.8	6.3	36.8	36.3	7.5	2.8	1.0
Don't know	601	5.3	1.6	5.4	47.9	30.3	9.6	-	1.0
No	22,874	2.6	1.7	4.1	53.4	30.4	6.6	1.2	0.2
Don't know	1,028	5.3	2.4	5.9	40.3	34.7	10.6	0.8	0.8
Not specified	3,349	0.3	-	0.5	4.7	1.7	0.9	91.9	0.2
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	3.9	1.8	5.2	47.0	34.4	6.8	1.0	0.3
26 to 75 percent	2,738	5.6	1.7	4.7	50.7	34.0	2.9	0.4	1.0
Over 75 percent	880	3.9	2.6	4.5	58.9	26.6	3.2	0.2	1.8
Don't know	1,830	3.4	2.0	2.7	48.1	34.0	8.7	1.1	0.6
No	12,901	2.4	1.4	4.2	53.1	29.7	7.7	1.3	0.3
Don't know	6,070	3.1	1.9	4.6	47.0	35.5	7.2	0.7	0.3
Not specified	3,605	1.6	-	0.7	7.4	3.1	1.1	86.1	0.7

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 7B. Percentage of Establishments Using, Planning, or Not Planning to Use: Automatic Guided Vehicle Systems

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolu standa error "Used operations (percent
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	1.5	0.8	3.0	51.2	28.2	6.6	8.7	
Major Group:									
34, Fabricated Metal Products	12,746	0.8	0.5	2.8	51.3	27.9	7.1	9.5	
35, Industrial Machinery and Equipment	13,176	1.7	1.0	2.3	56.1	25.5	6.2	7.2	
36, Electronic and Other Electric Equipment	7,293	1.8	0.8	4.2	46.0	30.4	6.5	10.3	
37, Transportation Equipment	3,425	3.3	1.5	3.5	46.3	28.9	6.7	9.8	
38, Instruments and Related Products	2,916	1.3	0.4	3.5	47.2	34.8	5.9	7.0	
Employment size:									
20 to 99	27,369	0.5	0.4	1.6	57.1	25.2	5.7	9.5	
100 to 499	9,903	1.7	1.0	4.5	41.2	35.9	8.3	7.4	
500 and over	2,284	13.1	4.7	12.8	24.5	29.8	9.8	5.3	
Age of plant (years):									
Under 5	4,731	0.5	0.2	3.5	59.1	28.3	7.3	0.9	
5 to 15	12,295	1.6	1.1	3.7	55.1	31.0	6.6	0.9	
16 to 30	10,690	1.4	0.9	2.8	55.1	31.7	7.3	0.9	
Over 30	8,464	2.6	0.9	3.2	53.8	30.4	7.6	1.4	
Not specified	3,377	0.2	-	(Z)	6.9	0.8	0.6	91.5	
Manufacturing process:									
Fabricated machining	6,870	1.0	0.8	2.4	61.2	26.6	7.2	0.8	
Assembly	5,688	2.3	1.2	4.3	53.6	32.4	5.2	1.1	
Both	21,016	1.8	0.9	3.4	51.8	33.3	8.0	0.9	
Neither	2,619	0.7	0.5	2.1	73.4	16.8	3.8	2.7	
Not specified	3,363	0.2	(Z)	0.3	6.0	1.0	0.9	91.4	
Market for most products:									
Consumer	4,451	1.9	1.0	5.2	52.7	32.2	6.2	0.8	
Commercial	5,342	2.0	0.9	4.7	49.2	35.3	7.1	0.8	
Industrial	17,861	1.2	0.8	2.4	59.1	28.8	6.8	0.8	
Transportation	3,243	2.8	1.2	4.4	49.1	32.4	8.5	1.6	
Government	2,626	2.0	1.3	3.0	51.8	35.1	5.7	1.0	
Other	2,137	1.5	0.5	2.3	56.5	25.1	11.8	2.3	
Not specified	3,896	0.3	(Z)	0.3	14.3	4.1	1.5	79.4	
Market price of most products:									
Less than $5	5,101	0.9	0.6	3.6	52.7	34.8	6.8	0.5	
$5 to $100	9,209	1.1	1.3	4.6	52.0	31.7	8.4	1.0	
$101 to $1,000	7,843	1.8	0.6	2.7	56.5	31.0	6.7	0.8	
$1,001 to $2,000	2,002	1.5	1.5	4.9	51.5	33.0	7.2	0.3	
$2,001 to $10,000	4,436	1.5	1.0	2.0	54.3	32.5	7.6	1.1	
Over $10,000	6,328	3.1	0.8	2.6	58.9	26.7	6.4	1.5	
Not specified	4,639	0.4	0.1	0.4	25.3	4.6	1.7	67.5	
Products made to military specifications:									
Yes	14,588	1.8	0.9	3.6	53.9	32.7	6.2	0.8	
No	19,439	1.4	0.9	3.0	56.8	29.0	7.7	1.2	
Don't know	2,141	2.6	0.6	3.6	53.2	31.3	7.8	0.8	
Not specified	3,388	0.2	0.1	-	6.1	1.6	1.0	91.0	
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	1.8	0.8	3.1	50.6	35.6	7.3	0.8	
26 to 75 percent	1,012	2.0	1.6	3.3	55.2	31.8	5.0	1.0	
Over 75 percent	683	4.3	0.9	3.2	48.2	35.7	5.3	2.4	
Don't know	601	2.0	1.1	2.2	53.4	29.6	11.1	0.6	
No	22,874	1.4	0.9	3.4	58.3	28.1	6.9	1.0	
Don't know	1,028	3.0	1.3	3.9	45.2	33.8	12.0	0.8	
Not specified	3,349	0.3	-	-	5.0	1.3	0.9	92.5	
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	1.6	1.0	3.8	53.4	32.8	6.7	0.7	
26 to 75 percent	2,738	2.2	0.3	2.7	57.0	34.0	2.9	0.9	
Over 75 percent	880	2.7	2.9	2.7	59.2	28.3	3.5	0.8	
Don't know	1,830	2.2	1.1	2.2	53.8	29.8	9.9	1.1	
No	12,901	1.3	0.7	3.1	58.4	27.2	8.1	1.3	
Don't know	6,070	1.8	1.1	3.4	52.1	33.1	7.7	0.7	
Not specified	3,605	0.3	-	0.2	9.1	3.1	1.1	86.3	

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, total, major group, and employment size, the numbers shown in this column are samp estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 8A. Percentage of Establishments Using, Planning, or Not Planning to Use: Automated Sensor Based Inspection or Testing Performed on Incoming or in Process Materials

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
		Used in operations	Plan to use within:		Do not plan to use because:			Not specified	
			2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
All establishments	39,556	10.0	4.0	7.9	41.9	21.0	6.3	8.9	0.3
Major Group:									
34, Fabricated Metal Products	12,746	6.7	3.1	6.6	46.6	20.2	7.3	9.6	0.5
35, Industrial Machinery and Equipment	13,176	8.5	3.7	8.1	43.2	22.3	6.4	7.7	0.6
36, Electronic and Other Electric Equipment	7,293	16.2	5.8	8.4	34.3	20.2	5.1	10.1	0.7
37, Transportation Equipment	3,425	12.7	3.7	8.4	40.2	18.6	6.3	10.1	0.6
38, Instruments and Related Products	2,916	12.2	5.7	10.2	36.4	23.1	5.1	7.3	0.7
Employment size:									
20 to 99	27,369	5.8	2.8	6.4	48.0	21.4	6.0	9.7	0.4
100 to 499	9,903	14.2	6.5	11.1	31.4	21.6	7.6	7.5	0.5
500 and over	2,284	41.5	7.9	11.4	14.8	13.5	5.3	5.5	0.7
Age of plant (years):									
Under 5	4,731	10.5	6.4	8.3	44.3	22.6	6.7	1.2	1.0
5 to 15	12,295	10.8	4.9	8.1	45.5	22.5	6.8	1.3	0.6
16 to 30	10,690	10.5	3.4	10.0	45.3	22.7	7.1	1.1	0.6
Over 30	8,464	11.7	3.7	7.6	45.2	23.6	6.9	1.3	0.7
Not specified	3,377	0.1	0.2	0.6	6.3	1.0	0.6	91.3	0.1
Manufacturing process:									
Fabricated machining	6,870	8.8	4.7	6.9	47.3	24.0	6.8	1.5	0.9
Assembly	5,688	13.1	5.2	9.0	44.8	22.1	4.5	1.1	0.7
Both	21,016	11.4	4.3	9.2	42.1	24.2	7.8	1.1	0.5
Neither	2,619	6.4	2.4	6.6	66.2	11.1	4.6	2.6	0.9
Not specified	3,363	0.4	0.4	0.6	5.8	0.6	0.9	91.3	0.3
Market for most products:									
Consumer	4,451	10.2	4.5	7.5	46.3	24.2	6.7	0.7	0.9
Commercial	5,342	11.5	5.0	8.9	42.4	25.4	5.7	1.0	0.8
Industrial	17,861	9.2	3.8	8.5	47.1	23.3	6.9	1.2	0.5
Transportation	3,243	15.4	6.3	10.8	39.6	18.3	7.7	2.0	1.1
Government	2,626	19.2	7.0	10.1	35.8	21.3	4.6	2.1	1.4
Other	2,137	6.9	2.6	5.8	50.7	21.0	11.4	1.6	1.1
Not specified	3,896	2.2	0.1	1.2	13.4	2.5	1.6	79.0	0.6
Market price of most products:									
Less than $5	5,101	12.1	6.6	10.3	40.2	23.6	6.2	0.9	0.9
$5 to $100	9,209	11.0	5.5	9.5	41.7	22.7	8.3	1.2	0.7
$101 to $1,000	7,843	11.1	3.7	8.5	46.8	22.8	6.1	1.0	0.8
$1,001 to $2,000	2,002	12.2	4.3	9.5	42.8	25.4	5.5	0.2	1.5
$2,001 to $10,000	4,436	9.1	3.4	6.9	46.3	26.5	7.0	0.8	0.8
Over $10,000	6,328	10.3	2.9	7.4	49.1	22.0	6.6	1.7	0.6
Not specified	4,639	2.8	1.0	1.5	21.5	2.8	2.4	68.0	0.7
Products made to military specifications:									
Yes	14,588	15.9	5.4	10.1	38.5	23.0	6.0	1.1	0.7
No	19,439	7.2	3.7	7.6	50.6	22.1	7.3	1.4	0.3
Don't know	2,141	9.8	3.7	6.3	42.4	28.4	8.0	1.1	1.6
Not specified	3,388	0.3	0.1	0.8	6.5	0.8	0.8	90.7	0.1
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	13.0	4.6	10.0	38.0	26.0	7.3	1.1	0.7
26 to 75 percent	1,012	21.1	6.6	13.2	30.9	24.3	2.7	1.0	2.6
Over 75 percent	683	22.5	4.8	10.7	30.2	24.3	5.4	2.1	2.6
Don't know	601	14.1	4.4	5.3	43.5	24.6	7.9	0.2	3.1
No	22,874	9.0	4.2	7.8	49.8	21.2	6.7	1.3	0.4
Don't know	1,028	10.9	5.7	7.1	40.1	24.3	11.2	0.8	1.6
Not specified	3,349	0.3	-	0.7	5.4	0.7	0.8	92.2	0.1
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	13.1	4.7	10.7	39.5	24.4	6.2	1.4	0.7
26 to 75 percent	2,738	20.4	5.6	8.7	37.4	24.9	2.1	0.8	1.8
Over 75 percent	880	21.0	8.5	8.3	43.4	15.9	2.6	0.2	3.5
Don't know	1,830	12.0	4.6	6.4	41.9	24.0	9.5	1.5	1.5
No	12,901	6.8	3.7	6.3	53.1	21.0	7.8	1.3	0.4
Don't know	6,070	8.8	4.3	9.9	44.0	24.2	7.9	0.9	0.7
Not specified	3,605	1.4	0.1	1.0	8.9	1.1	1.6	86.0	0.5

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 8B. Percentage of Establishments Using, Planning, or Not Planning to Use: Automated Sensor Based Inspection or Testing Performed on Final Product

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	12.5	4.5	7.9	40.9	19.4	6.1	8.8	0.4
Major Group:									
34, Fabricated Metal Products	12,746	8.3	3.4	7.6	44.3	19.7	7.2	9.5	0.6
35, Industrial Machinery and Equipment	13,176	9.9	4.5	7.8	43.3	20.8	6.1	7.5	0.7
36, Electronic and Other Electric Equipment	7,293	22.2	6.2	7.6	33.0	16.4	4.5	10.1	0.9
37, Transportation Equipment	3,425	14.4	3.4	8.3	39.5	17.7	6.2	10.3	0.7
38, Instruments and Related Products	2,916	15.4	6.3	9.1	36.4	20.6	5.1	7.1	0.8
Employment size:									
20 to 99	27,369	8.0	3.4	6.8	46.3	20.0	5.9	9.6	0.5
100 to 499	9,903	17.4	6.9	10.0	31.6	19.6	7.1	7.5	0.5
500 and over	2,284	44.3	8.1	10.7	15.9	11.1	4.3	5.6	0.7
Age of plant (years):									
Under 5	4,731	14.2	7.0	8.3	42.5	20.8	6.1	1.0	1.2
5 to 15	12,295	14.0	5.0	8.0	44.4	20.7	6.7	1.2	0.7
16 to 30	10,690	13.2	4.5	9.6	44.0	20.8	7.0	0.9	0.7
Over 30	8,464	13.2	4.2	8.1	44.8	22.0	6.4	1.3	0.7
Not specified	3,377	0.1	0.2	0.5	5.8	1.5	0.6	91.5	0.1
Manufacturing process:									
Fabricated machining	6,870	11.8	5.2	8.7	43.4	23.1	6.5	1.4	1.0
Assembly	5,688	17.4	5.8	7.1	44.8	19.4	4.2	1.3	0.8
Both	21,016	13.8	4.7	9.0	41.8	22.2	7.5	0.9	0.5
Neither	2,619	8.4	3.6	8.0	63.2	10.3	4.6	2.0	1.1
Not specified	3,363	0.5	0.3	0.3	5.9	0.7	0.9	91.4	0.3
Market for most products:									
Consumer	4,451	11.0	6.1	7.8	46.1	21.4	6.6	1.0	0.8
Commercial	5,342	14.4	4.8	8.4	42.9	22.9	5.6	1.1	0.9
Industrial	17,861	12.1	4.7	8.5	45.2	21.9	6.6	0.9	0.6
Transportation	3,243	20.0	5.6	11.9	37.6	16.0	7.0	1.8	1.3
Government	2,626	23.0	6.5	8.6	37.5	19.1	4.3	1.0	1.7
Other	2,137	7.7	2.8	7.0	48.7	20.7	11.0	2.0	1.1
Not specified	3,896	2.3	(Z)	0.7	13.0	2.9	1.8	79.3	0.6
Market price of most products:									
Less than $5	5,101	14.9	6.8	12.8	36.5	22.0	6.2	0.8	1.0
$5 to $100	9,209	14.6	6.4	9.1	39.2	21.3	8.3	1.2	0.8
$101 to $1,000	7,843	13.8	4.3	8.5	46.3	20.5	5.8	0.8	0.9
$1,001 to $2,000	2,002	13.6	6.2	9.0	42.2	23.4	5.2	0.5	1.6
$2,001 to $10,000	4,436	12.1	3.3	6.7	47.1	23.6	6.4	0.9	1.0
Over $10,000	6,328	11.9	3.1	6.1	50.6	20.8	6.2	1.3	0.8
Not specified	4,639	3.8	1.0	2.0	20.2	3.0	2.3	67.8	0.9
Products made to military specifications:									
Yes	14,588	19.2	6.1	10.0	36.9	21.2	5.7	0.8	0.8
No	19,439	9.6	4.0	7.8	49.7	20.3	7.1	1.4	0.4
Don't know	2,141	11.1	5.0	4.8	43.3	26.7	8.0	1.1	1.6
Not specified	3,388	0.3	-	0.6	6.0	1.3	0.8	91.0	0.1
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	16.0	5.1	9.1	38.6	23.0	7.1	1.0	0.8
26 to 75 percent	1,012	26.7	7.2	9.4	31.7	22.1	1.6	1.3	2.7
Over 75 percent	683	21.7	4.7	13.5	30.1	22.9	4.7	2.4	2.4
Don't know	601	17.3	4.4	8.0	42.8	18.9	7.8	0.7	3.4
No	22,874	11.7	4.7	8.2	47.8	20.2	6.4	1.1	0.5
Don't know	1,028	12.2	6.3	7.9	40.7	21.3	10.7	0.8	1.5
Not specified	3,349	0.4	-	0.4	5.0	1.0	0.9	92.3	0.2
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	16.2	5.2	11.0	37.7	22.6	6.1	1.1	0.8
26 to 75 percent	2,738	25.0	5.8	8.8	35.2	22.6	2.0	0.5	1.9
Over 75 percent	880	27.4	9.8	5.8	41.0	13.1	2.4	0.4	4.0
Don't know	1,830	12.4	4.7	8.3	42.1	22.3	9.0	1.2	1.5
No	12,901	9.7	4.1	6.3	52.1	19.1	7.5	1.3	0.5
Don't know	6,070	9.8	5.4	8.9	44.6	23.1	7.4	0.8	0.7
Not specified	3,605	1.7	(Z)	1.0	8.3	1.1	1.6	86.3	0.5

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 9A. Percentage of Establishments Using, Planning, or Not Planning to Use: Local Area Network for Technical Data

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
		Used in operations	Plan to use within:		Do not plan to use because:			Not specified	
			2 years	2-5 years	Not applicable	Not cost effective	Other reasons		
All establishments	39,556	18.9	9.1	8.1	36.7	10.6	7.6	9.1	0.4
Major Group:									
34, Fabricated Metal Products	12,746	13.4	7.1	7.8	41.2	11.8	9.1	9.6	0.8
35, Industrial Machinery and Equipment	13,176	18.5	9.3	8.2	38.9	10.1	7.2	7.8	0.8
36, Electronic and Other Electric Equipment	7,293	24.9	12.4	8.7	27.9	9.4	6.4	10.4	0.9
37, Transportation Equipment	3,425	22.0	8.0	7.0	35.2	10.0	7.4	10.5	0.9
38, Instruments and Related Products	2,916	25.8	10.6	8.4	31.2	10.8	5.6	7.5	1.0
Employment size:									
20 to 99	27,369	13.1	7.9	7.2	43.1	11.6	7.4	9.9	0.6
100 to 499	9,903	25.9	11.8	10.7	25.7	9.2	9.0	7.8	0.6
500 and over	2,284	58.6	12.6	7.9	8.2	3.3	4.0	5.4	0.6
Age of plant (years):									
Under 5	4,731	21.3	9.7	6.9	40.1	12.2	8.5	1.3	1.3
5 to 15	12,295	21.3	10.9	8.3	38.1	11.6	8.5	1.2	0.9
16 to 30	10,690	19.4	9.9	10.0	40.3	10.7	8.0	1.7	0.8
Over 30	8,464	20.7	8.7	8.9	40.5	11.9	8.0	1.4	0.9
Not specified	3,377	0.6	0.3	0.7	6.1	0.5	0.6	91.1	0.3
Manufacturing process:									
Fabricated machining	6,870	13.7	8.3	7.8	46.3	13.0	8.9	2.0	1.1
Assembly	5,688	26.2	12.3	7.6	36.8	10.2	5.5	1.3	1.0
Both	21,016	21.8	10.2	9.8	36.4	11.7	8.8	1.2	0.6
Neither	2,619	15.9	6.6	6.0	53.7	8.4	7.2	2.0	1.6
Not specified	3,363	1.1	0.4	0.2	5.6	0.7	0.8	91.2	0.4
Market for most products:									
Consumer	4,451	16.1	8.4	7.0	46.9	12.7	7.8	1.2	1.0
Commercial	5,342	24.4	9.8	9.7	35.4	11.9	7.5	1.3	1.1
Industrial	17,861	19.1	10.0	8.8	40.2	12.1	8.3	1.5	0.7
Transportation	3,243	24.8	12.2	10.4	34.0	8.7	8.5	1.4	1.4
Government	2,626	28.8	12.7	11.3	30.4	10.6	4.9	1.3	1.9
Other	2,137	16.7	7.5	6.3	45.0	9.0	12.9	2.6	1.8
Not specified	3,896	3.0	0.9	0.8	12.9	1.4	2.0	78.9	0.7
Market price of most products:									
Less than $5	5,101	16.7	8.7	8.4	41.8	14.8	8.9	0.7	1.1
$5 to $100	9,209	16.4	10.8	8.8	41.0	10.5	10.7	1.7	0.8
$101 to $1,000	7,843	20.0	9.9	7.7	41.8	11.9	7.5	1.2	1.0
$1,001 to $2,000	2,002	22.1	10.1	10.8	37.7	12.6	6.6	0.2	2.1
$2,001 to $10,000	4,436	22.0	9.4	10.9	35.7	12.8	7.5	1.6	1.4
Over $10,000	6,328	29.9	11.1	8.8	33.1	9.5	6.2	1.4	1.2
Not specified	4,639	4.9	1.4	1.9	19.4	2.1	2.4	67.8	0.8
Products made to military specifications:									
Yes	14,588	24.4	11.3	9.9	34.6	10.5	7.9	1.6	0.8
No	19,439	18.1	9.1	8.1	43.3	11.5	8.5	1.4	0.6
Don't know	2,141	16.5	8.4	8.3	40.2	18.5	7.4	0.8	1.8
Not specified	3,388	1.5	0.4	0.1	5.8	0.6	0.9	90.6	0.5
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	25.6	10.6	10.1	32.7	10.9	8.7	1.4	0.9
26 to 75 percent	1,012	31.9	14.8	9.2	28.3	10.2	3.0	2.7	2.6
Over 75 percent	683	31.5	8.5	9.4	34.8	7.7	5.7	2.5	3.4
Don't know	601	29.8	2.9	8.6	38.9	10.2	9.1	0.4	4.0
No	22,874	17.1	9.6	8.3	43.6	11.9	8.0	1.4	0.6
Don't know	1,028	22.7	11.1	7.1	34.3	12.1	11.7	0.8	2.2
Not specified	3,349	1.3	0.4	0.2	4.8	0.3	0.9	92.1	0.4
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	23.9	11.5	9.6	34.5	11.0	7.9	1.7	0.9
26 to 75 percent	2,738	29.3	10.8	10.1	35.4	10.2	3.0	1.2	2.0
Over 75 percent	880	26.7	10.5	11.0	37.0	9.0	5.2	0.7	3.7
Don't know	1,830	20.0	9.4	8.1	40.3	11.5	9.3	1.4	1.7
No	12,901	15.8	7.7	8.4	45.4	12.5	8.7	1.4	0.7
Don't know	6,070	19.5	11.6	7.1	39.9	11.0	10.4	0.6	1.2
Not specified	3,605	2.7	0.6	1.4	6.7	1.4	0.9	86.3	0.7

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 9B. Percentage of Establishments Using, Planning, or Not Planning to Use: Local Area Network for Factory Use

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	16.2	9.2	9.9	36.9	11.3	7.4	9.1	0.4
Major Group:									
34, Fabricated Metal Products	12,746	11.6	8.0	10.0	39.7	12.1	8.8	9.8	0.7
35, Industrial Machinery and Equipment	13,176	16.3	8.4	9.4	40.0	10.9	7.0	8.1	0.8
36, Electronic and Other Electric Equipment	7,293	21.1	12.4	10.6	28.8	10.4	6.6	10.1	0.8
37, Transportation Equipment	3,425	18.7	8.3	9.6	34.9	11.2	7.2	10.1	0.8
38, Instruments and Related Products	2,916	21.3	10.5	10.4	33.3	11.8	5.3	7.2	0.9
Employment size:									
20 to 99	27,369	11.0	7.4	8.7	43.2	12.6	7.2	9.9	0.5
100 to 499	9,903	22.9	12.2	13.3	25.9	9.5	8.6	7.7	0.6
500 and over	2,284	50.7	17.6	10.3	8.6	3.3	4.1	5.3	0.7
Age of plant (years):									
Under 5	4,731	18.0	11.1	9.0	39.9	12.9	7.9	1.1	1.3
5 to 15	12,295	17.4	10.8	10.7	38.9	12.0	8.7	1.5	0.8
16 to 30	10,690	17.1	9.8	11.7	39.8	12.2	7.9	1.5	0.8
Over 30	8,464	18.7	8.4	10.7	40.8	12.6	7.3	1.4	0.8
Not specified	3,377	0.3	0.2	0.7	6.2	0.5	0.6	91.5	0.2
Manufacturing process:									
Fabricated machining	6,870	12.2	10.1	9.6	43.8	14.5	8.0	1.7	1.0
Assembly	5,688	22.5	10.3	9.7	39.8	11.1	5.4	1.1	1.0
Both	21,016	18.8	10.0	12.0	36.7	12.3	8.8	1.3	0.6
Neither	2,619	12.1	8.6	6.5	54.1	8.9	7.1	2.7	1.4
Not specified	3,363	0.9	0.3	0.1	5.9	0.6	0.8	91.4	0.4
Market for most products:									
Consumer	4,451	17.2	8.8	9.6	43.4	12.9	7.3	0.8	1.1
Commercial	5,342	22.0	9.6	10.4	36.0	13.7	7.2	1.2	1.1
Industrial	17,861	15.9	9.7	11.3	41.0	12.7	8.1	1.3	0.7
Transportation	3,243	20.4	14.4	11.2	34.1	10.1	7.9	1.9	1.3
Government	2,626	22.8	13.2	11.4	32.9	12.2	5.9	1.6	1.8
Other	2,137	13.3	6.6	10.9	44.1	9.3	12.6	3.2	1.6
Not specified	3,896	2.7	0.8	0.6	12.9	1.6	2.1	79.3	0.7
Market price of most products:									
Less than $5	5,101	15.1	10.3	11.9	40.0	13.9	8.2	0.6	1.0
$5 to $100	9,209	17.7	10.5	10.7	38.3	11.7	10.0	1.2	0.9
$101 to $1,000	7,843	16.1	10.0	9.9	43.2	12.3	7.3	1.2	0.9
$1,001 to $2,000	2,002	18.5	11.3	11.2	37.4	14.3	6.8	0.4	2.0
$2,001 to $10,000	4,436	17.4	8.9	13.0	37.4	13.8	7.6	1.9	1.2
Over $10,000	6,328	21.8	10.3	10.7	37.2	11.5	6.8	1.7	1.0
Not specified	4,639	5.4	1.4	1.7	19.0	2.0	2.3	68.2	1.0
Products made to military specifications:									
Yes	14,588	21.4	12.5	11.8	34.2	11.2	7.6	1.4	0.8
No	19,439	15.1	8.3	10.2	44.0	12.6	8.4	1.4	0.5
Don't know	2,141	15.8	7.7	10.5	39.6	18.2	7.1	1.1	1.7
Not specified	3,388	1.0	0.5	0.1	6.0	0.4	0.9	91.2	0.3
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	22.0	11.2	12.1	32.7	11.9	8.5	1.6	0.9
26 to 75 percent	1,012	22.3	17.0	11.5	33.9	11.5	2.8	1.0	2.0
Over 75 percent	683	24.0	13.8	10.1	33.5	10.3	6.2	2.1	3.2
Don't know	601	20.7	7.2	13.6	39.0	9.7	8.8	1.0	2.8
No	22,874	15.2	9.1	10.2	43.7	12.7	7.9	1.3	0.5
Don't know	1,028	20.4	10.1	10.7	34.7	11.7	11.1	1.4	2.1
Not specified	3,349	0.9	0.3	0.2	4.8	0.4	0.9	92.4	0.3
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	20.1	12.6	12.0	34.9	11.5	7.6	1.4	0.8
26 to 75 percent	2,738	25.0	11.4	11.0	36.8	11.8	2.9	1.0	1.9
Over 75 percent	880	21.6	10.6	10.6	41.3	9.7	5.5	0.7	3.5
Don't know	1,830	18.0	9.1	12.0	38.9	11.3	9.3	1.4	1.7
No	12,901	14.1	7.5	9.1	45.5	13.9	8.3	1.6	0.6
Don't know	6,070	16.7	10.1	11.6	39.0	11.2	10.6	0.8	1.0
Not specified	3,605	1.8	0.3	1.4	7.2	1.5	1.1	86.6	0.6

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristics, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 9C. Percentage of Establishments Using, Planning, or Not Planning to Use: Intercompany Computer Network Linking Plant to Subcontractors, Suppliers, or Customers

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	14.8	7.9	12.4	34.0	13.9	7.8	9.1	0.4
Major Group:									
34, Fabricated Metal Products	12,746	14.9	7.5	11.3	34.6	13.4	8.7	9.6	0.8
35, Industrial Machinery and Equipment	13,176	12.4	7.8	12.9	37.2	14.5	7.1	8.1	0.7
36, Electronic and Other Electric Equipment	7,293	16.2	9.3	13.0	29.5	13.5	8.2	10.3	0.7
37, Transportation Equipment	3,425	21.7	7.4	12.7	28.9	12.1	7.0	10.3	1.0
38, Instruments and Related Products	2,916	13.8	7.6	13.3	33.9	16.9	7.3	7.3	0.7
Employment size:									
20 to 99	27,369	9.7	6.5	10.9	40.3	15.2	7.3	10.1	0.5
100 to 499	9,903	22.7	10.5	15.7	22.0	12.1	9.7	7.3	0.6
500 and over	2,284	41.8	13.2	16.8	10.4	5.9	6.6	5.3	0.7
Age of plant (years):									
Under 5	4,731	11.9	9.7	14.3	38.1	16.3	8.6	1.2	1.0
5 to 15	12,295	16.2	9.1	12.8	35.9	16.1	8.3	1.6	0.8
16 to 30	10,690	16.6	8.1	14.4	35.9	14.4	9.3	1.4	0.8
Over 30	8,464	18.0	8.1	13.0	37.6	14.1	7.9	1.4	0.8
Not specified	3,377	0.3	0.3	0.7	6.1	0.4	0.7	91.5	0.1
Manufacturing process:									
Fabricated machining	6,870	14.6	8.5	12.1	38.9	16.5	7.8	1.7	1.1
Assembly	5,688	18.3	8.4	14.1	36.3	15.4	6.2	1.3	1.0
Both	21,016	16.6	9.0	14.4	33.9	15.0	9.8	1.3	0.6
Neither	2,619	11.9	6.8	9.0	52.4	12.3	4.8	2.8	1.3
Not specified	3,363	0.5	0.3	0.3	6.0	0.5	0.9	91.4	0.2
Market for most products:									
Consumer	4,451	17.5	9.4	12.8	38.0	14.3	7.2	0.9	1.1
Commercial	5,342	16.4	8.7	16.6	33.7	15.6	8.2	0.8	1.0
Industrial	17,861	13.6	8.7	13.5	37.5	16.5	8.7	1.5	0.6
Transportation	3,243	32.6	10.4	11.8	27.0	9.5	6.9	1.8	1.6
Government	2,626	13.9	8.1	15.5	36.4	16.2	8.6	1.3	1.5
Other	2,137	12.2	5.9	10.2	43.1	12.2	12.9	3.5	1.6
Not specified	3,896	2.6	0.5	1.4	12.6	2.0	1.8	79.2	0.7
Market price of most products:									
Less than $5	5,101	21.5	9.3	12.5	33.3	14.3	8.3	0.8	1.2
$5 to $100	9,209	19.0	8.9	12.5	35.9	13.7	8.6	1.3	0.9
$101 to $1,000	7,843	13.7	8.9	14.1	39.8	13.9	8.7	0.9	0.9
$1,001 to $2,000	2,002	14.1	7.0	16.0	33.1	19.5	9.8	0.5	1.8
$2,001 to $10,000	4,436	11.8	7.7	14.6	36.5	18.6	8.8	2.0	1.0
Over $10,000	6,328	14.4	9.4	14.0	35.5	16.2	8.5	2.0	0.9
Not specified	4,639	4.8	1.4	3.7	16.6	3.6	1.7	68.2	0.8
Products made to military specifications:									
Yes	14,588	17.2	11.3	14.7	33.2	14.1	8.2	1.4	0.7
No	19,439	15.4	6.8	13.0	39.4	15.1	8.6	1.6	0.6
Don't know	2,141	15.7	6.8	10.8	34.2	22.6	8.7	1.1	1.8
Not specified	3,388	0.6	0.5	0.3	5.8	0.9	0.9	91.0	0.2
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	16.3	9.5	17.4	31.1	14.9	9.4	1.5	0.8
26 to 75 percent	1,012	16.3	9.0	15.7	35.0	15.5	7.1	1.3	2.2
Over 75 percent	683	17.0	9.9	11.3	36.2	14.6	7.9	3.0	2.9
Don't know	601	18.7	12.2	7.0	36.9	16.4	7.7	1.0	3.0
No	22,874	15.8	8.2	12.1	39.4	15.1	8.1	1.4	0.5
Don't know	1,028	18.4	6.9	12.4	32.7	16.6	11.6	1.4	1.9
Not specified	3,349	0.9	0.2	0.1	4.8	1.0	0.9	92.0	0.3
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	17.3	10.6	15.0	32.4	14.6	8.1	1.9	0.8
26 to 75 percent	2,738	15.3	9.7	17.0	35.6	16.5	5.2	0.6	1.6
Over 75 percent	880	18.6	4.8	16.3	42.1	11.2	6.1	0.9	3.5
Don't know	1,830	14.4	9.1	13.8	37.8	13.4	10.3	1.3	1.4
No	12,901	15.3	7.4	11.3	40.7	15.4	8.5	1.4	0.7
Don't know	6,070	16.1	7.3	13.9	35.2	15.8	10.6	1.1	1.0
Not specified	3,605	1.6	0.9	0.7	7.3	2.1	1.1	86.2	0.4

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 9D. **Percentage of Establishments Using, Planning, or Not Planning to Use: Programmable Controllers**

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolu standa error "Used operation (percent
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	32.1	4.6	6.1	32.4	9.9	6.0	8.9	0
Major Group:									
34, Fabricated Metal Products	12,746	26.8	4.9	6.8	33.4	11.0	7.6	9.6	1
35, Industrial Machinery and Equipment	13,176	33.9	4.7	5.6	33.4	9.5	5.3	7.5	1
36, Electronic and Other Electric Equipment	7,293	38.0	4.3	5.7	28.7	8.4	4.7	10.1	1
37, Transportation Equipment	3,425	32.0	3.5	5.9	31.7	10.6	6.0	10.3	1
38, Instruments and Related Products	2,916	32.7	5.2	6.7	33.3	10.0	4.7	7.4	1
Employment size:									
20 to 99	27,369	22.5	4.5	6.1	39.1	11.7	6.3	9.9	0
100 to 499	9,903	48.1	5.4	6.8	20.0	6.8	5.8	7.2	0
500 and over	2,284	77.8	3.2	3.1	6.3	2.0	2.6	5.1	0
Age of plant (years):									
Under 5	4,731	29.6	5.1	8.0	38.2	11.2	6.9	1.0	1
5 to 15	12,295	34.5	5.6	6.0	35.2	11.1	6.6	1.1	1
16 to 30	10,690	34.9	5.3	7.4	33.9	10.6	6.4	1.6	1
Over 30	8,464	39.0	3.8	5.9	33.8	10.4	6.1	0.9	1
Not specified	3,377	0.8	0.1	0.5	6.0	0.6	0.6	91.5	0
Manufacturing process:									
Fabricated machining	6,870	31.2	6.3	6.4	35.5	12.0	7.5	1.1	1
Assembly	5,688	30.5	3.8	6.4	42.7	10.2	5.0	1.3	1
Both	21,016	38.7	4.9	6.9	30.6	11.0	6.7	1.1	0
Neither	2,619	24.6	4.8	6.2	49.9	7.4	4.6	2.6	1
Not specified	3,363	1.1	0.1	-	5.8	0.7	0.9	91.4	0
Market for most products:									
Consumer	4,451	34.5	4.0	6.4	35.9	12.2	5.9	1.1	1
Commercial	5,342	34.3	5.7	7.9	33.3	11.1	6.1	1.5	1
Industrial	17,861	34.5	5.1	6.5	35.6	10.9	6.4	1.0	0
Transportation	3,243	44.3	6.6	6.2	27.8	8.3	5.3	1.5	1
Government	2,626	39.4	5.1	8.0	30.4	11.6	4.1	1.5	2
Other	2,137	24.5	3.4	5.6	41.7	9.5	12.9	2.4	2
Not specified	3,896	4.5	(Z)	0.4	12.4	1.7	1.8	79.2	0
Market price of most products:									
Less than $5	5,101	39.3	4.8	8.2	29.0	11.8	6.0	0.9	1
$5 to $100	9,209	35.7	5.1	7.0	33.4	10.0	7.4	1.3	1
$101 to $1,000	7,843	31.6	5.2	6.8	38.9	10.3	6.5	0.7	1
$1,001 to $2,000	2,002	32.1	4.7	6.9	34.9	14.5	6.7	0.2	2
$2,001 to $10,000	4,436	28.0	5.6	7.2	37.7	12.5	7.3	1.8	1
Over $10,000	6,328	39.8	5.1	4.6	33.2	10.4	5.2	1.7	1
Not specified	4,639	11.4	0.8	1.7	15.7	2.0	1.4	67.0	1
Products made to military specifications:									
Yes	14,588	41.2	5.6	7.7	30.0	8.8	5.6	1.0	1
No	19,439	30.7	4.6	6.2	38.6	11.6	7.0	1.3	0
Don't know	2,141	30.8	4.8	4.0	35.7	16.8	6.7	1.2	2
Not specified	3,388	2.1	0.1	(Z)	4.9	0.8	0.9	91.1	0
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	40.3	4.9	8.6	29.2	9.8	6.5	0.8	1
26 to 75 percent	1,012	37.0	9.0	7.4	33.0	9.7	3.5	0.5	2
Over 75 percent	683	42.1	5.3	8.0	30.5	8.8	2.9	2.6	4
Don't know	601	28.1	4.5	4.1	44.4	11.5	6.5	0.8	3
No	22,874	32.3	5.0	6.0	37.6	11.2	6.5	1.4	0
Don't know	1,028	37.8	3.5	4.2	31.6	11.6	9.9	1.4	2
Not specified	3,349	1.4	0.1	-	4.6	1.0	0.9	92.0	0
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	40.0	5.3	7.4	31.1	9.5	5.7	1.0	1
26 to 75 percent	2,738	42.5	5.6	8.3	31.8	8.0	2.8	1.2	2
Over 75 percent	880	37.2	3.3	10.1	36.0	11.3	2.0	0.1	4
Don't know	1,830	36.1	4.7	3.9	34.3	9.8	10.0	1.2	2
No	12,901	28.8	4.8	5.9	39.5	12.5	6.9	1.7	0
Don't know	6,070	34.1	5.3	6.7	34.0	11.1	8.1	0.7	1
Not specified	3,605	4.2	0.1	0.4	7.2	1.2	1.0	86.0	0

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimate Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Table 9E. Percentage of Establishments Using, Planning, or Not Planning to Use: Computers Used for Control on the Factory Floor

Establishment characteristic	Number of establishments[1]	Percent distribution							Absolute standard error of "Used in operations" (percent)[2]
			Plan to use within:		Do not plan to use because:				
		Used in operations	2 years	2-5 years	Not applicable	Not cost effective	Other reasons	Not specified	
All establishments	39,556	27.3	10.7	11.3	26.1	10.9	4.9	8.8	0.5
Major Group:									
34, Fabricated Metal products	12,746	21.1	11.3	11.6	28.2	11.7	6.5	9.5	0.9
35, Industrial Machinery and Equipment	13,176	28.1	10.1	11.9	27.3	10.9	4.1	7.6	1.0
36, Electronic and Other Electric Equipment	7,293	34.5	11.1	11.2	20.3	9.3	3.6	9.9	1.0
37, Transportation Equipment	3,425	27.4	9.1	9.3	27.8	11.2	5.3	9.9	1.0
38, Instruments and Related Products	2,916	32.3	11.5	10.1	23.9	11.3	4.1	6.9	1.1
Employment size:									
20 to 99	27,369	18.9	9.9	11.5	32.2	12.7	5.1	9.7	0.7
100 to 499	9,903	41.0	13.1	11.9	14.1	7.9	4.9	7.1	0.7
500 and over	2,284	68.0	9.3	7.1	5.1	2.9	2.6	5.0	0.6
Age of plant (years):									
Under 5	4,731	27.3	14.7	11.6	27.9	11.5	6.1	0.9	1.5
5 to 15	12,295	29.8	11.7	11.8	27.7	12.1	5.6	1.2	1.0
16 to 30	10,690	29.0	12.0	14.7	27.1	11.4	4.7	1.1	1.0
Over 30	8,464	32.1	9.5	10.6	29.1	12.5	5.1	1.1	1.1
Not specified	3,377	0.2	0.3	0.2	6.8	0.5	0.6	91.5	0.1
Manufacturing process:									
Fabricated machining	6,870	24.7	12.2	11.7	29.4	14.7	6.3	1.0	1.4
Assembly	5,688	32.6	10.9	9.0	30.9	11.9	3.8	0.9	1.1
Both	21,016	32.1	11.9	13.6	24.4	11.4	5.4	1.1	0.7
Neither	2,619	17.4	9.5	11.3	45.9	8.7	4.7	2.5	1.6
Not specified	3,363	0.7	0.4	-	6.0	0.5	1.0	91.4	0.3
Market for most products:									
Consumer	4,451	27.1	11.7	11.1	31.2	13.3	4.8	0.9	1.3
Commercial	5,342	33.0	9.7	12.5	26.6	11.9	5.0	1.4	1.3
Industrial	17,861	27.6	12.3	12.7	28.5	12.8	5.1	0.9	0.8
Transportation	3,243	34.5	13.4	14.1	22.8	8.6	5.4	1.2	1.6
Government	2,626	41.0	12.8	11.5	19.6	9.6	4.1	1.5	2.2
Other	2,137	24.0	8.2	10.9	34.6	10.7	9.6	2.1	2.2
Not specified	3,896	4.4	1.1	1.3	11.0	1.3	1.7	79.2	0.8
Market price of most products:									
Less than $5	5,101	26.4	14.5	15.2	25.0	13.7	5.0	0.2	1.3
$5 to $100	9,209	29.9	11.8	13.7	25.5	11.1	6.7	1.3	1.1
$101 to $1,000	7,843	29.6	13.0	12.1	29.7	10.5	4.5	0.6	1.2
$1,001 to $2,000	2,002	30.5	10.2	9.5	26.5	17.6	5.7	0.1	2.4
$2,001 to $10,000	4,436	30.7	9.5	11.5	29.4	12.9	4.9	1.1	1.6
Over $10,000	6,328	31.9	11.0	10.6	28.2	11.9	5.1	1.3	1.2
Not specified	4,639	7.9	1.4	2.6	16.0	2.2	1.4	68.5	1.1
Products made to military specifications:									
Yes	14,588	36.4	13.8	13.2	21.3	10.3	4.2	0.8	0.9
No	19,439	25.5	10.1	11.7	32.9	12.5	6.0	1.3	0.7
Don't know	2,141	22.6	10.5	11.9	29.1	18.4	6.3	1.1	2.0
Not specified	3,388	1.1	0.8	0.3	5.5	0.3	0.9	91.1	0.4
Prime defense contractor:									
Yes: Percent of products shipped to defense:									
1 to 25 percent	10,010	36.4	12.9	13.5	20.4	10.7	5.3	0.7	1.1
26 to 75 percent	1,012	42.6	15.1	12.1	21.8	5.6	2.3	0.6	3.0
Over 75 percent	683	37.6	9.9	10.5	25.1	10.8	3.9	2.2	4.1
Don't know	601	32.2	8.6	8.2	33.3	12.8	4.2	0.6	3.8
No	22,874	25.7	11.0	12.1	31.7	12.7	5.4	1.3	0.7
Don't know	1,028	31.2	12.3	9.2	26.4	12.5	7.0	1.4	2.7
Not specified	3,349	1.5	0.3	0.1	4.6	0.3	0.8	92.3	0.4
Subcontractor to defense:									
Yes: Percent of products shipped to prime defense contractor:									
1 to 25 percent	11,533	34.5	13.4	13.6	23.2	10.4	3.9	1.0	1.1
26 to 75 percent	2,738	43.5	12.6	14.6	16.7	9.6	2.1	1.0	2.3
Over 75 percent	880	39.6	12.3	15.1	21.2	8.2	3.4	0.1	4.4
Don't know	1,830	28.6	9.0	11.4	29.8	12.2	7.5	1.5	2.2
No	12,901	22.8	9.5	10.4	36.3	13.7	6.0	1.3	0.8
Don't know	6,070	27.9	13.7	12.7	24.8	12.8	7.5	0.7	1.3
Not specified	3,605	3.0	0.5	1.4	7.4	0.7	0.8	86.1	0.5

- Represents zero. (Z) Represents less than .05 percent.

[1] For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in Appendix D.

[2] A description of the standard error of the estimate is given in Appendix C, "Sampling and Estimating Methodology."

Appendix A. **Explanation of Terms**

Manufacturing Technologies. The definitions and terms for the manufacturing technologies listed below were developed after consultation with several trade associations, primarily the Robotic Industries Association and the Automation Forum. The major government agencies consulted were the International Trade Administration and the National Institute of Standards and Technology.

Computer-Aided Design (CAD) and/or Computer-Aided Engineering. Use of computers for drawing and designing parts or products and for analysis and testing of designed parts or products.

Computer-Aided Design (CAD)/Computer-Aided Manufacturing (CAM). Use of CAD output for controlling machines used to manufacture the part or product.

Digital Data Representation. Use of digital representation of CAD output for controlling machines used to manufacture the part or product.

NC/CNC Machine. A single machine either numerically controlled (NC) or computer numerically controlled (CNC) with or without automated material handling capabilities. NC machines are controlled by numerical commands, punched on paper or plastic mylar tape while CNC machines are controlled electronically through a computer residing in the machine.

Flexible Manufacturing Cell (FMC). Two or more machines with automated material handling capabilities controlled by computers or programmable controllers, capable of single path acceptance of raw material and single path delivery of finished product.

Flexible Manufacturing System (FMS). Two or more machines with automated material handling capabilities controlled by computers or programmable controllers, capable of multiple path acceptance of raw material and multiple path delivery of finished product. A FMS may also be comprised of two or more FMC's linked in series or parallel.

Materials Working Laser. Laser technology used for welding, cutting, treating, scribing, and marking.

Robot. A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

Pick and Place Robot. A simple robot, with one, two, or three degrees of freedom, which transfers items from place to place by means of point-to-point moves. Little or no trajectory control is available.

Automatic Storage and Retrieval System (AS/RS). Computer controlled equipment providing for the automatic handling and storage of materials, parts, subassemblies, or finished products.

Automatic Guided Vehicle System (AGVS). Vehicles equipped with automatic guidance devices programmed to follow a path that interfaces with work stations for automated or manual loading and unloading of materials, tools, parts, or products.

Technical Data Network. Use of local area network (LAN) technology to exchange technical data within design and engineering departments.

Factory Network. Use of local area network (LAN) technology to exchange information between different points on the factory floor.

Programmable Controller. A solid state industrial control device that has programmable memory for storage of instructions, which performs functions equivalent to a relay panel or wired solid state logic control system.

Computers Used for Control on the Factory Floor. Exclude computers imbedded within machines, or computers used solely for data acquisitions or monitoring. Include computers that may be dedicated to control, but which are capable of being reprogrammed for other functions.

Appendix B. **Survey of Manufacturing Technology Form**

DUE DATE: 30 DAYS AFTER RECEIPT

OMB No. 0607-0623: Approval Expires 06/89

FORM **SMT-1**
(7-19-88)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF MANUFACTURING TECHNOLOGY

NOTICE — Response to this inquiry is **required by law (title 13, U.S. code)**. By the same law your report to the Census Bureau is **confidential**. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are **immune from legal process.**

In correspondence pertaining to this report, please refer to this Census File Number (CFN)

Please complete this form and RETURN TO

BUREAU OF THE CENSUS
1201 East Tenth Street
Jeffersonville, IN 47133

Please refer to Definition of Terms on the reverse side of the transmittal letter.

Section A — TECHNOLOGY USE

INSTRUCTIONS

For EACH of the technologies listed below, mark (X) in the column that best reflects this plant's use of or plans for that technology. Report each technology separately even though it may be used within a "cell" or "system". Be sure to mark the appropriate column 4—6 if there are no plans to use the technology.

		Used in operations	Not currently used in operations				
			Plan to use within:		No plans to use because:		
			The next 2 years	2 – 5 years	Does not apply to operations	Not cost effective	Other
		(1)	(2)	(3)	(4)	(5)	(6)
1. DESIGN AND ENGINEERING							
a. Computer aided design (CAD) and/or computer aided engineering (CAE)	11						
b. CAD output used to control manufacturing machines (CAD/CAM)	12						
c. Digital representation of CAD output used in procurement activities	13						
2. FABRICATION/MACHINING, AND ASSEMBLY							
a. Flexible manufacturing cell(s) (FMC) or system(s) (FMS)	21						
b. NC/CNC machine(s)	22						
c. Materials working laser(s)	23						
d. Pick and place robot(s)	24						
e. Other robots	25						
3. AUTOMATED MATERIAL HANDLING							
a. Automatic storage and retrieval system (AS/RS)	31						
b. Automatic guided vehicle systems (AGVS)	32						
4. AUTOMATED SENSOR BASED INSPECTION AND/OR TESTING EQUIPMENT							
a. Performed on incoming or in process materials	41						
b. Performed on final product	42						
5. COMMUNICATIONS AND CONTROL							
a. Local area network for technical data	51						
b. Local area network for factory use	52						
c. Intercompany computer network linking plant to subcontractors, suppliers, and/or customers	53						
d. Programmable controller(s)	54						
e. Computer(s) used for control on the factory floor	55						

PLEASE CONTINUE ON REVERSE SIDE →

Appendix B. **Survey of Manufacturing Technology Form**

Section B — CHARACTERISTICS OF THIS ESTABLISHMENT

1. How many years has this establishment manufactured products at this location?	01	1 ☐ Less than 5 years 2 ☐ 5 to 15 years 3 ☐ 16 to 30 years 4 ☐ Over 30 years
2. How would you characterize the nature of manufacturing at this plant?	02	1 ☐ Fabrication/Machining 2 ☐ Assembly 3 ☐ Fabrication/Machining and assembly 4 ☐ Neither fabrication/machining nor assembly
3. What is the average market price for most products of this plant?	03	1 ☐ Less than $5 2 ☐ $5 to $100 3 ☐ $101 to $1000 4 ☐ $1001 to $2000 5 ☐ $2001 to $10,000 6 ☐ Over $10,000
4. What is the market for most products of this plant?	04	1 ☐ Consumer (personal use by household) 2 ☐ Commercial (e.g. offices, hospitals, services, etc.) 3 ☐ Industrial (manufacturing, mining, construction, and utilities) 4 ☐ Transportation 5 ☐ Government 6 ☐ Other 7 ☐ Can't specify
5. Are any of the products produced in this plant manufactured to military specifications?	05	1 ☐ Yes 2 ☐ No 3 ☐ Don't know
6. Are any of the products manufactured at this plant shipped directly to Federal defense agencies (such as the Department of Defense, Departments of the Army, Navy, Air Force, Marine Corps, the Defense Logistics Agency, etc.)?	06	Yes — **What percentage (based on value of goods and services) of all products manufactured at this plant are shipped to Federal defense agencies on an annual basis?** 1 ☐ 1–25% 2 ☐ 26–75% 3 ☐ Over 75% 4 ☐ Don't know 5 ☐ No 6 ☐ Don't know
7. Are any of the products manufactured at this plant shipped to other companies that are prime contractors to Federal defense agencies.	07	Yes — **What percentage (based on value of goods and services) of all products manufactured at this plant are shipped to prime contractors on an annual basis?** 1 ☐ 1–25% 2 ☐ 26–75% 3 ☐ Over 75% 4 ☐ Don't know 5 ☐ No 6 ☐ Don't know

Section C — VERIFICATION

Please check to make certain that one column is marked for EACH of the technologies listed in section A and one box is marked for EACH of the characteristics in section B. This is very important since it affects our ability to process the survey results.

THANK YOU FOR YOUR COOPERATION

Remarks

Section D — CONTACT

Name of person to contact regarding this report		Telephone		
		Area code	Number	Extension
Title of contact	Date			

FORM SMT-1 (7-19-88)

APPENDIX C. **SAMPLING AND ESTIMATING METHODOLOGIES**

SAMPLING METHODOLOGY

The statistics in this report are based upon a sample of establishments selected randomly. The methodology used in selecting the sample was as follows.

First, the scope of the survey was defined to be all manufacturing plants with total employment of 20 or more in major groups 34-38. The 1987 Census mailout file was the basis for identifying this universe. Because the census mailout file represents an early attempt to identify the manufacturing universe, however, it was recognized that numerous problems arose in the use of it as a frame—especially as regards the quality of plant SIC codes and whether or not plants were still active. Since the SMT survey was to be selected during the time the census was being conducted, it was decided to take advantage of the census information being collected and update the mail file whenever possible. Thus, the in-scope cases initially identified were matched against the Census Bureau's master economic file, the Standard Statistical Establishment List (SSEL), which was updated regularly during the period of the census. Plants no longer active or with SIC codes now out of scope of the survey were dropped from the frame. We were not able to identify newly in-scope plants during this updating operation, however. A total of 39,556 establishments were identified as in-scope following this operation. For sampling purposes and publication considerations, the universe frame was stratified on the basis of SIC(3) and TE size. Three TE size breaks were used in the stratification process: 20-99, 100-499, and 500 or more.

Since the survey's primary intent was to have the capability of producing estimated establishment counts and prevalence rates at the stratified levels and above, it was decided that simple random sampling within strata, whereby every stratum establishment received the same probability of selection, was the most efficient sampling design. Based upon relative standard error constraints imposed uniformly upon each strata, a minimum sample size needed to satisfy each constraint was calculated. For some of the smaller strata, it was subsequently decided to sample all establishments of the strata. An overall sample of 10526 establishments was selected for the survey.

ESTIMATION

Estimated establishment counts for the various cell categories in the published tables are derived as simple weighted estimates since the inverse of the sampling fractions for the strata comprising a published cell can be treated as sampling weights for the strata establishments. Thus, each estimated cell total j is of the form

$$X_j' = \sum_{k \in j} \sum_{i}^{nk} W_k X_{ik}$$

where X_j' is the estimated total establishment count for cell j,

n_k is the total number of sample cases in the kth stratum comprising cell j,

W_k is the sampling weight associated with the n_k establishments of stratum k,

X_{ik} = 1 if establishment i of the kth stratum satisfies the criteria of interest defined by cell j,

= 0 if it does not.

In order to estimate the variance on an estimated total X_j' for cell j, it is necessary to estimate the variance contribution of each of the individual stratum (SIC-3, TE size) cells which combine to form cell j. The sum of these stratum variances is the variance for cell j. For a given stratum k, the variance is estimated by

$$\begin{aligned}\sigma^2_{x_k'} &= (1 - p_{x_k'})(W_k)(W_k - 1)\sum_{i=1}^{nk} X^2_{ik} \\ &= (1 - p_{x_k'})(W_k)(W_k - 1)(n_{x_k'})\end{aligned}$$

Where n_k, W_k *and* X_{ik} are defined as above,

$$n_{x_k'} = \sum_{i=1}^{nk} X^2_{ik}$$ is the total number of establishments in stratum k satisfying the criteria of interest, and

$$p_{x_k'} = n_{x_k'} / n_k$$

Then $\sigma^2_{x_j'} = \sum_{k \in j} \sigma^2_{x_k'}$ and the relative variance $V^2_{x_j'}$ is

$$V^2_{x_j'} = \sigma^2_{x_j'} / (X_j')^2$$

Finally $V_{x_j'}$ is the relative standard error of the estimated total X_j' and is the value appearing in the tables containing estimated establishment counts.

Prevalence rates are expressed as the ratio of two estimated establishment counts. Thus, the prevalence rate for some cell j of interest is

$$r_j = X_j' / Y_j'$$

where X'_j and Y'_j are simple weighted counts as defined previously. The variance $\sigma^2_{r_j}$ of prevalence rate r_j is

$$\sigma^2_{r_j} = r^2_j \left[\sigma^2_{x'_j} / X'^2_j + \sigma^2_{y'_j} / Y'^2_j - (2)\left(\sigma_{x'_j y'_j}\right) / X'_j Y'_j \right]$$

where $\sigma^2_{x'_j}$ and $\sigma^2_{y'_j}$ are computed as indicated above, and the covariance term $\sigma_{x'_j y'_j}$ is the sum of stratum covariances , $\sigma_{x'_k y'_k}$, $k \in j$ where

$$\sigma_{x'_k y'_k} = [1 - (p_{x'_k}\ p_{y'_k} / p_{x'_k y'_k})][W_k][W_k - 1][n_{x'_k y'_k}],$$

$p_{x'_k}$ and $p_{y'_k}$ are defined as before,

$n_{x'_k y'_k}$ is the number of sample establishments satisfying the criteria of interest as defined by *both* X'_j and Y'_j , and

$$p_{x'_k y'_k} = n_{x'_k y'_k} / n_k$$

It should be noted that for some of the rates, Y'_j is a known universe total, and therefore the variance and covariance terms involving Y'_j are zero. Also, for the tables containing prevalence rates, absolute standard errors are displayed rather than relative standard errors.

LIMITATIONS OF DATA

1. Sampling Error: The sample drawn for this survey is but one of many possible samples that could have resulted utilizing the sampling methodology described earlier. Each of these possible samples would likely yield somewhat different estimates. The sampling error for a given sample is defined as the difference between the sample estimate and the result theoretically obtainable from a comparable complete canvass of the target population. For our particular sample, this error is of course unknown. A guide to the potential size of the sampling error is provided by the estimated relative standard errors (for establishment counts) and standard errors (for prevalence rates) as described above and as shown for selected items in the data tables.

   In conjunction with its associated estimate, the standard error can be used to construct confidence intervals about the sample estimate. These intervals allow one to ascribe a probability or confidence that the complete coverage value falls within them. More precisely,

   a. the interval defined by one standard error above and below the sample estimate can be expected to include the complete coverage value with 67 percent confidence,

   b. the interval defined by two standard errors above and below the sample estimate can be expected to include the complete coverage value with 95 percent confidence, and

   c. the interval defined by three standard errors above and below the sample estimate can be expected to almost certainly include the complete coverage value.

   For establishment counts, relative standard errors appear in the tables. To convert a relative standard error to a standard error, use the formula

   $$\sigma_{x'} = V_{x'}\,(X').$$

   Then $X' \pm m\,\sigma_{x'}$ for $m = 1, 2,$ and 3 defines the intervals described above. For prevalence rates, the standard error is what appears in the tables.

2. Nonresponse: Not all selected establishments chose to respond to the survey, and not all respondents completed each questionnaire item. No attempt was made to impute for either type of nonresponse and, in fact, we have chosen to provide as a separate estimate in each of the table presentations a corresponding "not specified" estimate. This means that every mailed establishment of the survey is accounted for in each of the tables. The not specified estimates may contain establishments other than nonrespondents. For example, if a respondent indicated to us that the plant surveyed was out of business, this was tallied as not specified. In any event, estimated counts cannot be interpreted as universe estimates unless the not specified cell happens to be zero. They can be characterized as representing estimated lower bounds.

   Because of the not specified classification, the prevalence rates presented in the tables should also be viewed with caution as they are based strictly upon reporters for the appropriate categories. Thus, for example, the prevalence rate in table 5A for USED IN OPERA TIONS-AGE OF PLANT UNDER 5 YEARS is based only upon (1) those respondents who reported that the age of their plants is less than five years of age, and (2) the subset of those same respondents who reported that they use the technology defined by table 5A. We were not able to obtain a response for every plant to the age of plant inquiry (thus the NOT SPECIFIED row under the age of plant category), and we were not able for all plants who reported age of plant less than five years to obtain a response relative to the status of that particular technology (thus the NOT SPECIFIED column for the age under five category). As mentioned above, no attempt was made to ascribe responses to plants that either failed to return their questionnaire or who returned the questionnaire but failed to answer particular inquiries. If the response pattern of such nonrespondents were known, it is likely that the prevalence rates would be somewhat different.

3. Quality of Universe Frame: As mentioned briefly in the discussion on sampling methodolgy, the census mailout file—from which the sampling frame was constructed—was recognized as having deficiencies. Of concern was the fact that SIC codes, company ownership, plant status (active/ not active), employment, etc., would change as the census enumeration took place.

For some plants this would result in their in-scope status being changed. It was for this reason that an update was performed on the originally identified cases based upon the results of the census as known at the time. This update did not reflect all eventual census changes, thus there remained cases on the universe file improperly in scope. Sample cases that fit this discription and that responded to the survey and informed us that they should not have been included for whatever reason were for the purposes of this report tabulated according to their originally sampled SIC and employment classification. They were tabulated either as a respondent, if the questionnaire was also completed, or as a nonrespondent, if it was not. The compensating correction to the frame, namely the identification of newly determined in-scope cases, was not made since we were limited in the update to the originally identified frame elements. We are not able to quantify either of these frame errors.

APPENDIX D.
ESTIMATES OF RELATIVE STANDARD ERROR FOR THE NUMBER OF ESTABLISHMENTS, BY CHARACTERISTIC

Establishment characteristic	Number of establishments	Relative standard error (percent)[1]
Age of plant (years):		
Under 5	4,731	3.4
5 to 15	12,295	1.9
16 to 30	10,690	2.1
Over 30	8,464	2.2
Not specified	3,377	4.1
Manufacturing process:		
Fabrication/ machining	6,870	3.0
Assembly	5,688	2.2
Both	21,016	1.1
Neither	2,619	4.0
Not specified	3,363	4.1
Market for most products:		
Consumer	4,451	3.0
Commercial	5,342	2.9
Industrial	17,861	1.3
Transportation	3,243	3.4
Government	2,626	4.3
Other	2,137	5.0
Not specified	3,896	3.8
Market price of most products:		
Less than $5	5,101	2.9
$5 to $100	9,209	2.2
$101 to $1,000	7,843	2.6
$1,001 to $2,000	2,002	5.4
$2,001 to $10,000	4,436	3.5
Over $10,000	6,328	2.6
Not specified	4,639	3.6
Products made to military specfications:		
Yes	14,588	1.6
No	19,439	1.2
Don't know	2,141	5.5
Not specified	3,388	4.1
Prime defense contractor:		
Yes, percent of products shipped to defense:		
1 to 25 percent	10,010	2.1
26 to 75 percent	1,012	5.9
Over 75 percent	683	8.3
Don't know	601	9.4
No	22,874	1.0
Don't know	1,028	6.9
Not specified	3,349	4.1
Subcontractor to defense:		
Yes, percent of products shipped to prime defense:		
1 to 25 percent	11,533	2.0
26 to 75 percent	2,738	4.5
Over 75 percent	880	8.7
Don't know	1,830	5.6
No	12,901	1.7
Don't know	6,070	2.9
Not specified	3,605	4.0

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[1] A description of the standard error of estimate is given in Appendix C, "Sampling and Estimating Methodology."

Related Reports

The Bureau of the Census publishes the following related reports:

Current Industrial Report

Series	Frequency	Title
MA35R	Annually	Computers and Office and Accounting Machines
MA35X	Annually	Robots
MQ35W	Quarterly	Metalworking Machinery
MA36A	Annually	Switchgear, Switchboard Apparatus, Relays, and Industrial Controls
MA38B	Annually	Selected Instruments and Related Products

Other Industry Reports

M3-1	Monthly	Manufacturers' Shipments, Inventories and, Orders
(AS)	Annually	Annual Survey of Manufacturers (ASM)
(MC)	Quinquennially	Census of Manufactures

Contacts For Data Users

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